POWER USER

PRESARIO 7000T-933

$1999‡

As low as $56 per month†

QuickAccess Code: 51X9X6-62367P

Intel® Pentium® III Processor, 933 MHz
128 MB 133 MHz SyncDRAM expandable to 384 MB
30.0 GB (7200 rpm) UltraDMA Hard Drive[1]
16X DVD-ROM Drive[5]
32 MB nVidia TNT2 M64 Pro Graphics
56K ITU V.90 Modem[3]
Creative Labs 1373 Audio with 128 Voices
JBL Platinum Speakers with Digital Audio Port
Compaq CV735 17" Monitor (16.0" VIA)

Personalize by choosing:

8X CD-RW Drive[4]: Add $199
Compaq CV935 19" Monitor (18.0" VIA): Add $180

MUSICIAN

PRESARIO 7000T-800

$1899‡

As low as $53 per month†

QuickAccess Code: 51X9X6-62362N

Intel Pentium III Processor, 800 MHz
128 MB 133 MHz SyncDRAM expandable to 384 MB
20.0 GB (7200 rpm) UltraDMA Hard Drive[1]
40X Max CD-ROM Drive[2]
8X CD-RW Drive[4]
32 MB nVidia TNT2 M64 Pro Graphics
56K ITU V.90 Modem[3]
SoundBlaster™ Live! Value Audio
Klipsch ProMedia V.2 400 Watt Speakers
Compaq CV735 17" Monitor (16.0" VIA)

Personalize by choosing:

16X DVD-ROM Drive[5]: Add $50
32 MB DDR Graphics: Add $179

PHOTO ENTHUSIAST

PRESARIO 7000T-800

$1499‡

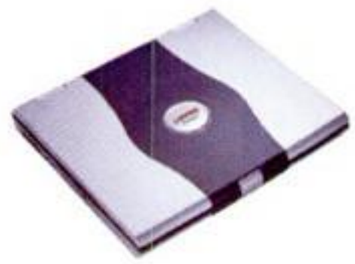
As low as $42 per month†

QuickAccess Code: 51X9X6-62362P

Intel Pentium III Processor, 800 MHz
128 MB 133 MHz SyncDRAM — up to 11 MB Shared for Video
20.0 GB (7200 rpm) UltraDMA Hard Drive[1]
16X DVD-ROM Drive[5]
32 MB nVidia TNT2 M64 Pro Graphics
56K ITU V.90 Modem[3]
Creative Labs 1373 Audio with 128 Voices
JBL Platinum Speakers with Digital Audio Port
Compaq CV735 17" Monitor (16.0" VIA)

Personalize by choosing:

Agfa Snap Scan USB Scanner: Add $99
FujiFilm MX-1200 Digital Camera: Add $289



POWER USER

PRESARIO 1800T-750

$2999‡

As low as $84 per month†

QuickAccess Code: 51X9X6-61346

Intel Pentium III Processor, 750 MHz,
featuring Intel® SpeedStep™ Technology
15.0" TFT SXGA+ Active Matrix Display
128 MB SyncDRAM
20.0 GB UltraDMA Hard Drive[1]
24X Max CD-ROM Drive[6]
ATI Mobility M3 with 16 MB Video Memory
56K ITU V.90 PCI Modem[3]
Integrated 10/100 BaseT Network Port

Personalize by choosing:

192 MB SyncDRAM: Add $100
CD-RW Drive[4]: Add $250
32.0 GB UltraDMA Hard Drive[1]: Add $250

TRAILBLAZER

PRESARIO 1800T-700

$2799‡

As low as $78 per month†

QuickAccess Code: 51X9X6-6144X

Intel Pentium III Processor, 700 MHz,
featuring Intel SpeedStep Technology
15.0" TFT SXGA+ Active Matrix Display
64 MB SyncDRAM
15.0 GB UltraDMA Hard Drive[1]
8X DVD-ROM Drive[7]
ATI Mobility M3 with 16 MB Video Memory
56K ITU V.90 PCI Modem[3]
Integrated 10/100 BaseT Network Port
Microsoft® Windows® 2000 Professional

Personalize by choosing:

Presario University Learn On-line: Add $79/year
Compaq Carrying Case: Add $49
128 MB SyncDRAM: Add $200

JET-SETTER

PRESARIO 1700T-600

$1999‡

As low as $56 per month†

QuickAccess Code: 51X9X6-61943

Intel Pentium III Processor, 600 MHz,
featuring Intel SpeedStep Technology
14.1" TFT Active Matrix Display
64 MB SyncDRAM
6.0 GB UltraDMA Hard Drive[1]
8X DVD-ROM Drive[7]
ATI Mobility Hardware Accelerated 3D Graphics
with 8 MB Video Memory
56K ITU V.90 PCI Modem[3]
Hi-Capacity Lilon Battery
256 KB Integrated "On-chip" Cache
Microsoft® Windows® 98 Second Edition Installed
with Free Upgrade to Windows® Millennium Edition[#]

Personalize by choosing:

128 MB SyncDRAM: Add $200
Presario University Learn On-line: Add $79/year

Includes Windows® Millennium Edition — the home version of the world's favorite software.††

Compaq Retailers: ABC Warehouse, American Appliance, **American TV, Best Buy,** bigcityexpress.com, **Brandsmart USA,** Buy.com, CDW, **Circuit City, CompUSA,** Computers4Sure.com, Conn's, DataVisi
Outpost.com, **PC Connection,** PC Richard & Son, PC Warehouse, **RadioShack,** RadioShack.com, RCS Computer Experience, Sears, **Staples,** The Wiz, **Tiger Direct,** ValueAmerica.com, WorldSpy.com **Visit a**

†All prices shown are Compaq Direct selling prices and do not include monthly Compaq.net service fees, applicable sales tax, and shipping, are valid in the U.S. only, and are subject to change or cancellation without notice. Illustrations may not accurately represent exact configurations priced. Retail p
APR. Your APR may be higher. There is no fee for Compaq purchases billed directly to your account. However, there is an access check fee of 3% of the U.S. Dollar amount of each advance check ($5 min./$30 max.). ††**Compaq.net powered by MSN™ Promotions** with purchase of a qualifying Co
For You' 1200T, 1400T, 1700T, and 1800T Series notebooks.) **Both promotions require:** (1) a valid major credit card; (2) a purchase receipt; and (3) acceptance of the Compaq.net Internet Access member agreement. **If you do not continue as a member for the required period of time, you**
Access promotion. **Compaq.net Rebate requires:** sign up for a new account, 36-month membership to Compaq.net powered by MSN Internet Access at $21.95 per month plus applicable taxes. **6 Months Free Promotion requires:** sign up for a new account; 12 month membership at $21.95 pe
time. Compaq.net Internet Access is available only for personal non-commercial use. Local market network activity and capacity may affect access availability. Local phone and/or long distance toll charges may apply. It is your responsibility to check with a local phone company to determine if access nu
7000T Series models (one color per kit). Offer valid for purchases made between 6/4/00 and 1/31/01 while supplies last. Please allow 6 to 8 weeks for delivery. To qualify, you must be a legal U.S. resident 18 years of age or older. Void where prohibited or restricted by law. Compaq reserves the right to
from K56flex- or V.90-compliant digital sources. Maximum achievable download transmission rates are currently unknown, may not reach 56 Kbps, and will vary with line conditions. [4]CD-RW drive data transfer rates may vary as follows: for recording to CD-R media, the data transfer rate may vary from
[5]24X Max CD-ROM data transfer rates may vary from 1500 to 3600 Kbps. [7]8X DVD-ROM drives read a minimum of 4463 Kbps and a maximum of 10820 Kbps. [#]Free upgrade to Windows Millennium Edition for purchases after 8/15/00. ††Microsoft® Windows® Millennium Edition pre-installed on Comp
Intel, the Intel Inside Logo, and Pentium are registered trademarks, and Celeron and Intel SpeedStep are trademarks, of Intel Corporation. Microsoft, MS, and Windows are registered trademarks and MSN is a trademark of Microsoft Corporation. Products and company names mentioned herein may be

Copyrighted material

FAMILY CHAMPION

PRESARIO 5000T-733

$1199‡

As low as $34 per month†

QuickAccess Code: 51X9X6-62259

Intel Pentium III Processor, 733 MHz
64 MB 100 MHz SyncDRAM — up to 11 MB Shared for Video
10.0 GB (7200 rpm) UltraDMA Hard Drive[1]
16X DVD-ROM Drive[5]
8X CD-RW Drive[4]
2X AGP with 64-bit Hardware Accelerated 3D Graphics
56K ITU V.90 Modem[3]
ESS Allegro Integrated PCI Audio
JBL Platinum Speakers with Digital Audio Port
Compaq CV535 15" Monitor (13.8" VIA)

Personalize by choosing:

Compaq CV735 17" Monitor (16.0" VIA): Add $70
APC Back-UPS Pro Office 280: Add $89

WEB SURFER

PRESARIO 5000T-667

$899‡

As low as $26 per month†

QuickAccess Code: 51X9X6-62257

Intel Pentium III Processor, 667 MHz
64 MB 100 MHz SyncDRAM — up to 11 MB Shared for Video
10.0 GB (7200 rpm) UltraDMA Hard Drive[1]
40X Max CD-ROM Drive[2]
2X AGP with 64-bit Hardware Accelerated 3D Graphics
56K ITU V.90 Modem[3]
ESS Allegro Integrated PCI Audio
JBL Platinum Speakers with Digital Audio Port
Compaq CV535 15" Monitor (13.8" VIA)

Personalize by choosing:

Compaq CV735 17" Monitor (16.0" VIA): Add $70
20.0 GB UltraDMA Hard Drive[1]: Add $60

SPECIAL OFFERS

GET A $400 REBATE OR 6 MONTHS FREE INTERNET SERVICE

Sign up for Compaq.net powered by MSN™ for 36 months, and get a $400 rebate. Or get six months free when you sign up for 12 months of Compaq.net.‡‡

PICK YOUR FAVORITE COLOR

Change the color of your PC with a MyStyle Accent Kit. Choose from Ruby Red, Emerald Green, Sapphire Blue, Amethyst Purple, or Amber Orange. FREE* with purchase of select Presario PCs.

— *Desktop only*

Desktop & Notebook Colors

MUSICIAN

PRESARIO 1400T-600

$1899‡

As low as $53 per month†

QuickAccess Code: 51X9X6-62X28

Intel Celeron™ Processor, 600 MHz
12.1" TFT Active Matrix Display
64 MB SyncDRAM
6.0 GB UltraDMA Hard Drive[1]
CD-RW Drive[4]
Trident CyberBlade Hardware Accelerated 3D Graphics
56K ITU V.90 PCI Modem[3]
Ultra Hi-Capacity Lilon Battery
128 KB Integrated "On-chip" Cache
MyStyle Accent Kit
Microsoft Windows 98 Second Edition Installed with Free Upgrade to Windows Millennium Edition[6]

Personalize by choosing:

128 MB SyncDRAM: Add $200
13.3" TFT Panel: Add $100
Presario University Learn On-line: Add $79/year

WEB SURFER

PRESARIO 1200T-566

$999‡

As low as $28 per month†

QuickAccess Code: 51X9X6-62122

Intel Celeron Processor, 566 MHz
12.1" HPA Display
32 MB SyncDRAM
5.0 GB UltraDMA Hard Drive[1]
24X Max CD-ROM Drive[5]
Trident CyberBlade Hardware Accelerated 3D Graphics
56K ITU V.90 PCI Modem[3]
NiMH Battery
128 KB Integrated "On-chip" Cache
Microsoft Windows 98 Second Edition Installed with Free Upgrade to Windows Millennium Edition[6]

Personalize by choosing:

32 MB SyncDRAM: Add $99
Presario University Learn On-line: Add $79/year
APC Notebook Surge Protector: Add $29

TECHNOLOGY SPOTLIGHTS

FUTURE BAY™ TECHNOLOGY

Choose from optional drives, including DVD, CD-RW, CD-ROM, and floppy. When you want to use one of your drives, simply pop it into the Future Bay. It's the ultimate in flexibility in a thin and light notebook. Available only on the Presario 1700T Series.

DESKTOP VIDEO CENTER

USB and IEEE-1394 ports are located on the front of the PC, so you can plug in cameras, camcorders, scanners, and other digital imaging devices. It's never been faster or easier to create and edit your own home videos.

m, Fred Meyer, Fry's Electronics, Handtech.com, h.h. Gregg, Insight.com, J&R Computer World, Micro Center, MicroWarehouse, Nationwide Computers & Electronics, Nebraska Mega Mart, Office Depot, Compaq *Built for You Custom PC Center* at retailers highlighted in bold.

ces may vary. Not all models available in all retail stores. Compaq is not liable for editorial, pictorial, or typographical errors in this advertisement. †Financing on approved credit by arrangement with Compaq Financial Services through MBNA America Bank, N.A. Payment based on a 48-month term at 14.99% qpaq Presario personal computer between 7/1/00 and 12/31/00. Offer not available at all Compaq Retailers; check store for availability. (Qualifying models: Presario 5BW1XX and 7AP1XX Series and 'Built For You' 5000T and 7000T Series desktops. Presario 14XL2XX, 17XL2XX, and 18XL2XX Series, and 'Built **ill be required to pay MSN a termination fee equal to 70% of the monthly service fee multiplied by the number of months requiring payment remaining in your membership period.** These promotions may not be combined with each other, or with any other Compaq.net or MSN Internet rmonth (plus applicable taxes) for the 7th through 12th months. For new Compaq.net members, no termination fee will apply if you cancel your membership during the first month. Available only to U.S. residents 18 years or older. Compaq and MSN reserve the right to modify or withdraw this promotion at any abers are local. See store for additional details. *Compaq MyStyle Accent Kit introductory mail-in offer (plus shipping & handling $7.95) valid only with purchase of the following Compaq Presario PCs: 1400 Series, 5CA1XX Series, 5BW1XX Series, 7AP1XX Series, 7EL1XX Series, and 'Built for You' 5000T and rmodify or withdraw this promotion at any time. See coupon, retailer, or www.compaq.com/athome/color. Questions? Call 713-300-3053. [1]For hard drives, GB=billion bytes. [2]40X Max CD-ROM data transfer rates may vary from 2550 to 6000 Kbps. [3]ITU V.90 modems are designed only to allow faster downloads e 50 to 600 Kbps; for writing to CD-RW media, the data transfer rate may vary from 150 to 300 Kbps; for reading to CD media, the data transfer rate may vary from 1500 to 3600 Kbps. An appropriate license may be required. [5]16X DVD-ROM drives read a minimum of 5545 Kbps and a maximum of 21640 Kbps. aq 'Built For You' desktops and 1800T notebooks. Windows® 98 Second Edition pre-installed on Compaq 'Built For You' 1200T, 1400T, and 1700T. Compaq, the Compaq Logo, and Presario are registered in the U.S. Patent and Trademark Office, and Future Bay is a trademark, of Compaq Computer Corporation. rademarks and/or registered trademarks of other companies. Call Compaq Monday–Friday, 7:00am–11:00pm (CT). Saturday and Sunday, 7:00am–7:00pm (CT). ©2000 Compaq Computer Corporation. All rights reserved. 5964/10/00

Copyrighted material

All about RAID:
Why two hard drives are better than one!

The ATI Radeon:
How it competes against GeForce 2

Celeron vs Duron:
Benchmark battle of the budget CPUs!

MAXIMUM PC

▶ MINIMUM **BS**

OCTOBER **00**

YOUR COMPLETE GUIDE TO WIRELESS COMPUTING

- E-mail pagers
- Net phones
- Web PDAs
- Wireless networking
- High-speed mobile modems

What works? What doesn't? We reveal the TRUTH behind the wireless hype!

imagine
MEDIA WITH PASSION
$7.99 US $8.99 CANADA
10>
0 71486 03353 0

Copyrighted material

Presario 7000T Series Internet PCs
Featuring Intel® Pentium® III Processors

Presario 1700T Series Internet Notebook PCs
Featuring Intel® Pentium® III Processors

Copyrighted material

Compaq **Home**

Break on through to your other side.

You've always known you had a creative side. Or maybe you have a practical side. Or even an entrepreneurial side. Compaq can help you explore all of them, with a wide range of innovative technology designed to make whatever you want to do, easier. Like ultrathin, ultracool notebooks for your adventurous side. Powerful desktops for your energetic side. And the latest Intel® Pentium® III processors for your competitive side. Plus, every one comes pre-loaded with Compaq.net powered by MSN.™‡ Choose one of the PCs here, or let us build one to your exact specifications. It could be just the break you've been looking for.

One of the Presario PCs inside is right for you. Take a look.

1-800-892-6607 www.compaq.com/athome
Buy direct from Compaq or from your favorite retailer.

COMPAQ

intel inside
pentium® III

This One
WZ2F-2JY-YODS

Copyrighted material

YOU'D SMILE TOO IF YOU'D JUST BEEN NAMED

PC WORLD
2000 WORLD CLASS

The editors of PC World magazine judged hundreds of products based on performance, consistency, innovation and value. Their verdict? "AMD's Athlon Processor is a superstar in all four" and "Athlon-based PCs sprinted to the top of our corporate and home PC charts." These are just a few of the reasons that they chose the AMD Athlon™ processor as "Product of the Year."

Copyrighted material

AMD

Athlon™ PROCESSOR

PC WORLD MAGAZINE'S PRODUCT OF THE YEAR.

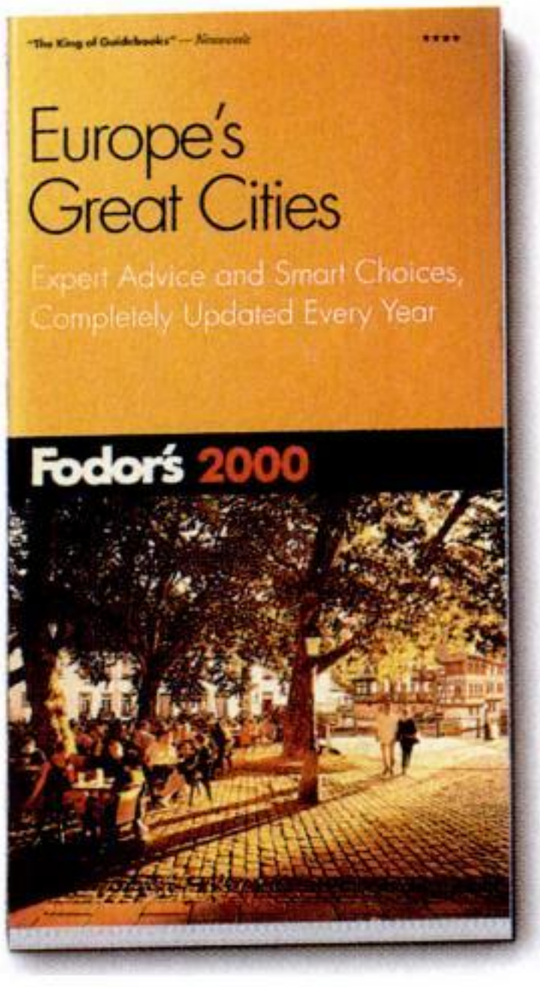
You'd think we'd be used to this by now. After all, AMD Athlon processors have already won more than 65 awards worldwide. But when we hear things like "record-breaking performance," "architecturally superior to Intel Pentium III" and "the first to hit a clock speed of 1 gigahertz, beating Intel at its own game," we still can't help but grin. You will too when you see what an AMD Athlon processor can do for your productivity. Log on to **www.amd.com/pcworld.**

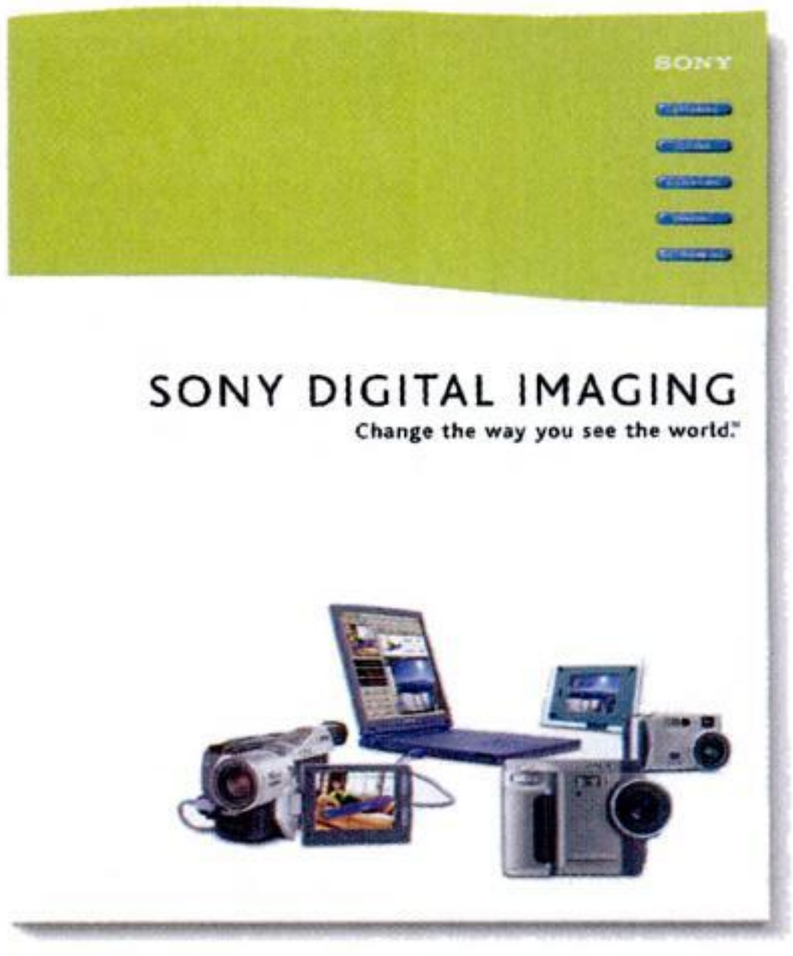
© 2000 Advanced Micro Devices, Inc. AMD, the AMD logo, AMD Athlon and combinations thereof are trademarks of Advanced Micro Devices, Inc. Pentium is a registered trademark of Intel Corporation. See July 2000 issue of PC World for complete article.

Copyrighted material

CAPTURING EDITING DISPLAYING SHARING NETWORKING

SONY


"The King of Guidebooks" — Newsweek
Europe's Great Cities
Expert Advice and Smart Choices, Completely Updated Every Year
Fodor's 2000



Required reading.

Call 1•800•693•4446 for your free Sony Digital Imaging Guide.

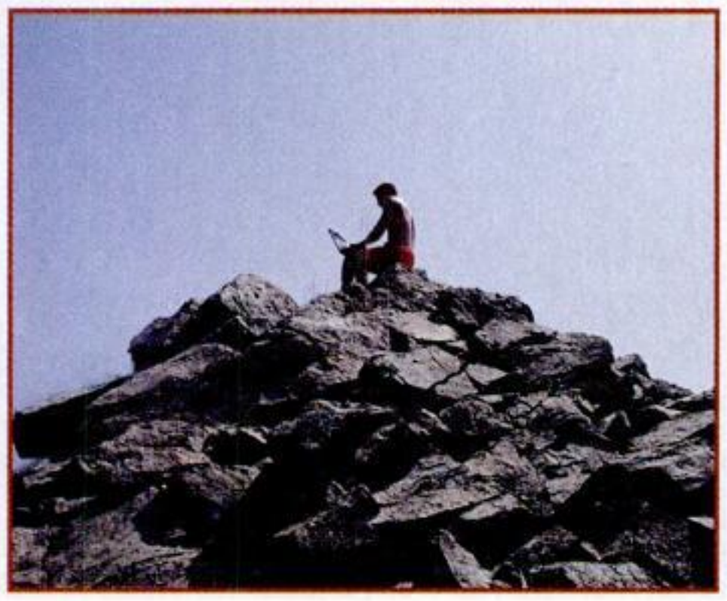
Going somewhere? Then there are two things you need to read. A travel guide, to help you see the sights. And the new Sony Digital Imaging Guide. So you'll know how to capture every last detail and how to share them with your friends and family back home, instantly. From digital cameras to camcorders, laptops to printers, the Sony Digital Imaging Guide simplifies the world of Digital Imaging products and gives you a personalized recommendation on what's best for you. Call today for your free guide and let Sony, the expert in Digital Imaging, change the way you see the world.

©2000 Sony Electronics, Inc. Reproduction in whole or in part without written permission is prohibited. All rights reserved. Sony and Change the way you see the world. are trademarks of Sony.

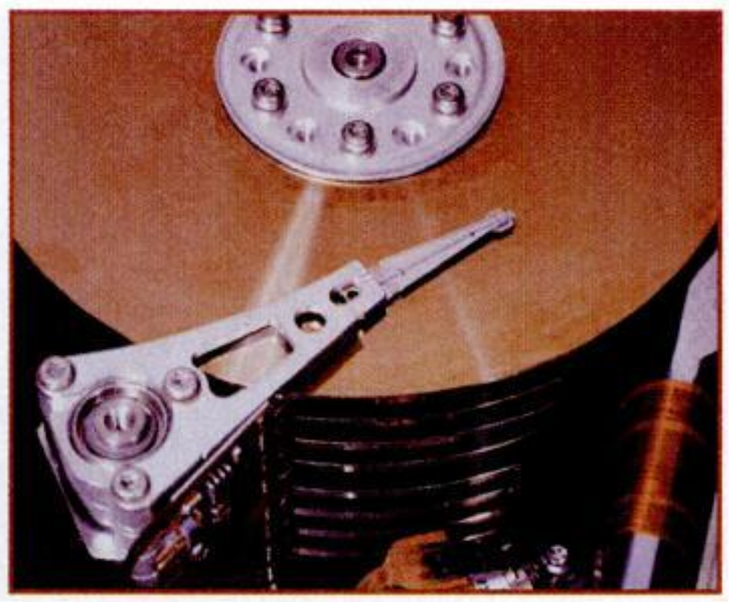
Copyrighted material

MAXIMUM PC
OCTOBER 2000

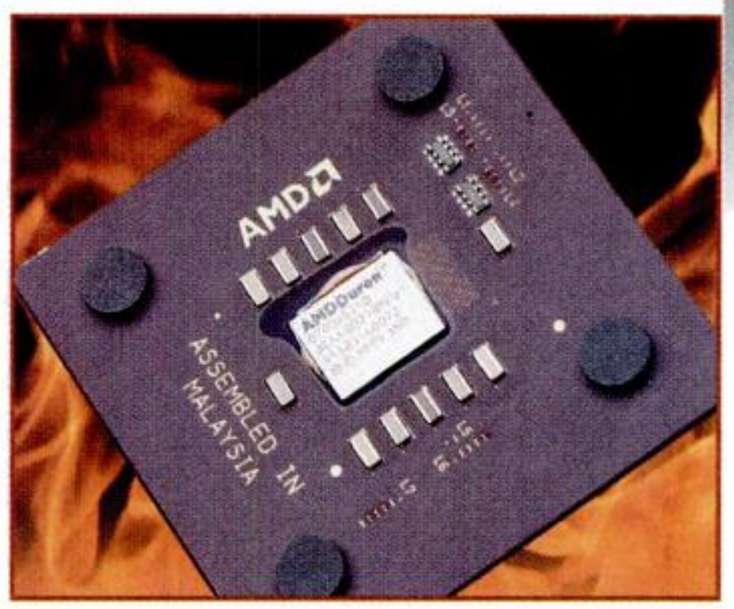
THIS ISSUE



30 Wireless



42 All About RAID



52 Celeron vs. Duron

FEATURES

30 World Without Wires
Tired of a life rife with clunky wires and tangles? We tear apart all things wireless—from WAP phones to home networking kits—to slap down the hype fueling the latest PC trend.

42 RAID—Kills bugs dead?
Double your hard drive pleasure with striping, mirroring, and parity. We tell you what tools you'll need, and the steps to follow, to make your PC twice as nice.

52 Celeron vs. Duron
Who's got the best budget bang for the buck? Which proc is more overclockable? Intel and AMD take it to the street in another CPU grudge match.

TECH FILES

21 Watchdog
Kenwood's court-ordered testing, Smart and Friendly's untimely demise, and The Dog's obituary column.

59 White Paper
All you ever wanted to know about Symmetric Multiprocessing, including when it's coming to a PC near you.

65 Ask the Doctor
Long-boot laments, CPU retention (we hear there's a cream for that), and weirdness in Windows 2000.

PRODUCTS

25 Peripheral Vision
This month: tranquility from noise-reducing headphones, storage bliss with a digital wallet, and espionage on the go with a wristwatch camera—what impeccable timing, Mr. Bond.

68 Reviews
Axis presents a system that doesn't suck... **Intel** and **Soyo** duke it out in a mobo showdown... **ATI's Radeon** streaks into Kick Ass territory... **Sony** sends out the David and Goliath of monitors... High-end soundcards from **Digital Audio Labs**, **Gadget Labs**, and **Tracer** all promise harmony... **HP** and **Samsung** use "lasers" in their multifunction printers as part of their plan for world domination... SCSI hard drives from **Seagate** and **Quantum** blow our benchmarks away... Windows 98, third edition—ahem, **Windows ME**—falls short of expectations... **1Vision's 1Safe** shows that backup isn't all it's cracked up to be... a step back for women's libbers everywhere, **Heavy Metal: F.A.K.K.2**... and **Icewind Dale** never heats up.

NEWS

16 Inside Sources
PC Previews, News, and Factoids
Broadband Direct comes closer, the P4 caters to SDRAM, and we find other uses for Mac's new G-4 Cube.

VOICES

8 Ed Word
Ed-dude **Jon Phillips** details why the PC *isn't* about to be deep-6'd by game consoles and net appliances—despite the claims of idiot pundits.

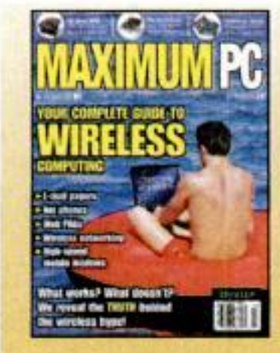
11 CommPort
Letters, letters, letters... One reader asks, "Where are the bikini-clad babes?" While another pleads, "Stop Daddy from downloading porn!"

27 Fast Forward
Tom Halfhill weighs the implications of buying a PC off the shelf or getting a custom job made to spec.

29 Game Theory
T. Liam McDonald gives the Gordon Gecko speech on why "Greed Is Good" for the gaming industry.

96 Glitch
Breaking news! Roller coaster tycoon indicted for gross disregard for human life! Read the shocking details inside...

COVER PHOTOGRAPHY BY JACK HUTCHESON



On the cover:

Wireless 30
RAID 42
Radeon 72
Budget CPUs 52

Copyrighted material

TDK

TDK®

veloCD burner + 100% Certified CD-R

Making choices is what it's all about, and TDK makes your choice easy with the world's fastest, purest CD burner and 100% Certified CD-R discs. Extract and compile all your music tracks. Funnel multimedia sources or analog, digital or Internet music sources directly to your computer, then take them wherever you go. Even if where you have to go involves not moving that far at all.

TOUCH THE THE SWEETSPOT OF DIGITAL AUDIO RECORDING: WWW.VELOCD.TDK.COM

Copyrighted material

velocd

24x
AUDIO CD RIP

INTERNAL
ATAPI / EIDE
CD-REWRITABLE DRIVE

12x	10x	32x
WRITE	REWRITE	DATA READ

RIP. ROCK. ROLL.

Extract the sweetnes at 24X, the absolute fastest, purest digital audio extraction on the planet.
** Rip a 3-minute song from a CD in less than 8 seconds. No other burner even comes close.*

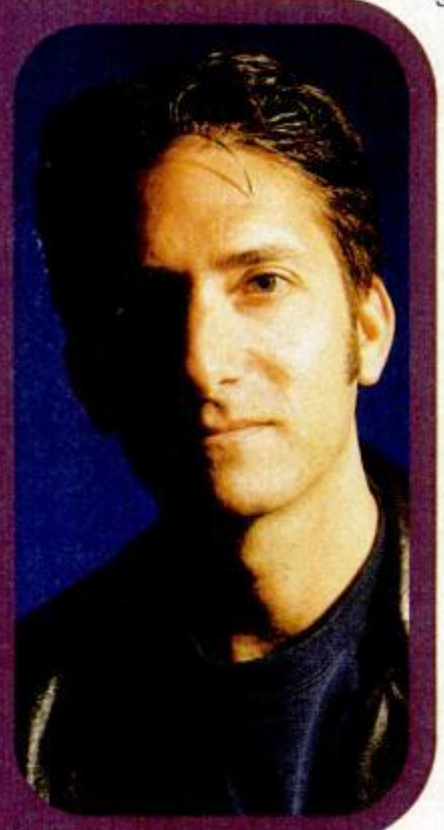
Crystallize the sweetness with the power of 12X burns.
** Record a full CD in just 6 minutes. TDK CD Blender software automatically processes MP3, WMA and WAV file playlists to record play-anywhere 100% Certified CDs.*

Get moving with Failsafe Write Protection.
** Run multiple applications with no chance of buffer underruns...no more CD coasters....just perfect recordings every time. Only veloCD has it.*

Copyrighted material

EDWORD

Do Idiot Pundits Even Use PCs?



The PC's day is done—or so say the idiot pundits. My take? I believe that if natural selection says the PC's day is done, then let's let it die and make way for more powerful technology. But no pundit should make sweeping assertions without first reviewing all the issues at hand. Anyone who contends that the game console or net appliance is about to supplant the desktop PC lacks a basic understanding of how people actually use computers.

If you're like me, you spend a lot of time word processing and surfing the web. In fact, I think we can all agree that most everyone who uses a PC engages in these two activities on a regular basis. Other folks up the ante by using their PCs for spreadsheet analysis and content creation, be it print design, photo editing, video editing, or what have you. So how do these activities play out on a game console or net appliance hooked up to TV set? Very, very poorly. Let's take a look at just some of the problems you'll encounter in a world without PCs.

Data entry: Typing for long periods of time is an ergonomic challenge. It's trying enough when you're sitting upright in an office chair and using your hands in an ergonomically correct manner. But just imagine how long you'll last when your butt is wedged into a love seat and you have to balance a keyboard on your knees. Bottom line: Users won't tolerate the hostile living-room work environment.

Text legibility: What do you think of your TV's ability to render text? I have a 27-inch Trinitron TV with a digital comb filter—and its text legibility still sucks compared to an average PC monitor. A TV's relatively low refresh rate is fine for moving pictures, but will induce eye-strain in anyone who has to read large blocks of text for extended periods of time. Today's typical TV also boasts pathetic resolution and dot pitch. Will you really tolerate reading a 500-word e-mail message if it can only be rendered as well as an ESPN sports score?

Web surfing: Today's web pages are coded for display on a 800x600 screen that sits about 15 inches from your face. How will these pages look on a low-res TV sitting eight feet from your face? They'll look awful. You won't be able to read text, and images will look like crap. Sure, your console's browser software will do its best to render pages in an agreeable manner, but the effort won't suffice. And don't even think that site designers will code for multiple platforms. Some sites will be designed for PCs, while others will be designed for TVs. But the best-looking sites will be designed for PCs because PCs offer a richer visual experience.

People buy PCs not only to accommodate current needs, but to accommodate the hobbies and professional duties of tomorrow.

Productivity: Game consoles and net appliances are closed platforms. For reasons too numerous to mention, they're not being developed for content creation and editing. People buy PCs not only to accommodate current needs, but to accommodate the hobbies and professional duties of tomorrow. In this respect, game consoles and net appliances are poor investments—and just plain out of the question if you already use your PC the way most Mac owners use their Macs.

The advent of high-res TVs will mitigate some of the stumbling blocks described above, but the fact is, our basic computing *modus operandi* will keep the PC off the endangered species list for many years to come.

—Jon Phillips

MAXIMUM PC

OCT00 vol5issue10

EDITORIAL
Jon Phillips editor-in-chief
Katherine Stevenson managing editor
Gordon Mah Ung senior editor
Kristen Shepos-Salvatore features editor
Josh Norem reviews editor
Will Smith technical editor
Geoffrey Visgilio associate editor
Scott Tarr associate technical editor
Kenn Durrence disc editor
contributing editors Tom Halfhill, T. Liam McDonald, M. Stephanie Murray
contributing writers Carl Lindemann, Michael Ryan, Brad Sparks, Lenny Bailes
Andrew Sanchez editor emeritus

ART
Ruth Murphy art director
Aprill Bridgeman associate art director
Wayne Allen creative director
contributing photographers Mark Madeo, Jack Hutcheson
contributing illustrators XPLANE

PRODUCTION
Richard Lesovoy production director
Eric O'Connell production coordinator

ADVERTISING
Chris Coelho publisher
Bernard Lanigan eastern advertising director
Nancy Romano regional sales manager
Sharon Kiernan marketplace manager
Alison McCreery marketing manager
Renata Scantlin sales coordinator
Doug Haynie business manager
DIGITAL ADVERTISING
Rudy Tabasa director of sales
Kelly MacNamara eastern sales manager
Darren Glidden regional sales manager

CIRCULATION
Stephanie Flanagan group circulation director
Erik Alekman newsstand director
Peggy Mores senior fulfillment manager
Mary Firme online marketing manager
Nicole Patterson direct marketing specialist

REPRINTS
PRINT AND DIGITAL
Reprint Management Services 717.399.1900

imagine MEDIA WITH PASSION

Imagine Media, Inc.
150 North Hill Dr. Brisbane, CA 94005
(415) 468-4684 www.imaginemedia.com

Executive Chairman • Chris Anderson
Vice President/CFO • Tom Valentino
Vice President/Circulation • Holly Klingel
Vice President/Human Resources • Steve Leibman
General Counsel • Charles Schug

IMAGINE BUSINESS DIVISION:
President • Michela O'Connor Abrams
(Business 2.0)

IMAGINE COMPUTING DIVISION:
President • Cheryl England
(MacAddict, Maximum PC, Maximum Linux, DigitalFOTO)

IMAGINE ENTERTAINMENT DIVISION:
President • Jonathan Simpson-Bint
(PC Gamer, PSM, Next Generation, Games Business)

Imagine Media is aimed at people who have a passion. A passion for games. For business. For computers. Or for the Internet. These are passions we share. Our goal is to feed your passion with the greatest magazines, web sites, and CD-ROMs imaginable. We love to innovate, we love to have fun, and we have a cast-iron rule always to deliver spectacular editorial value. That means doing whatever it takes to give you the information you need. With any luck, we'll even make you smile sometimes...Thanks for joining us.

THE future NETWORK

Imagine Media Inc is part of The Future Network plc. The Future Network plc serves the information needs of groups of people who share a passion. We aim to satisfy their passion by creating magazines and websites that offer superb value for money, trustworthy information, multiple ways to save time and money, and are a pleasure to read or visit. This simple strategy has helped create one of the fastest-growing media companies in the world: we publish more than 100 magazines, 20 magazine websites and a number of web networks from offices in five countries. The company also licenses 42 magazines in 30 countries. The Future Network is a public company quoted on the London Stock Exchange (symbol: FNET).
Media with Passion
Bath **London** Milan **Munich** New York **Paris** San Francisco

Copyrighted material

Anything:

"New Releases"

Anytime:

amazon.com

Everywhere:

It's never too soon to curl up with a new release. Visit Amazon.com for the latest, greatest books on everything from childcare to mystery to cooking and travel. And, even better, Amazon.com's new releases are delivered right to your doorstep. Get it first with Visa®—the payment card preferred by book lovers everywhere.

www.visa.com

VISA

The Online Currency.

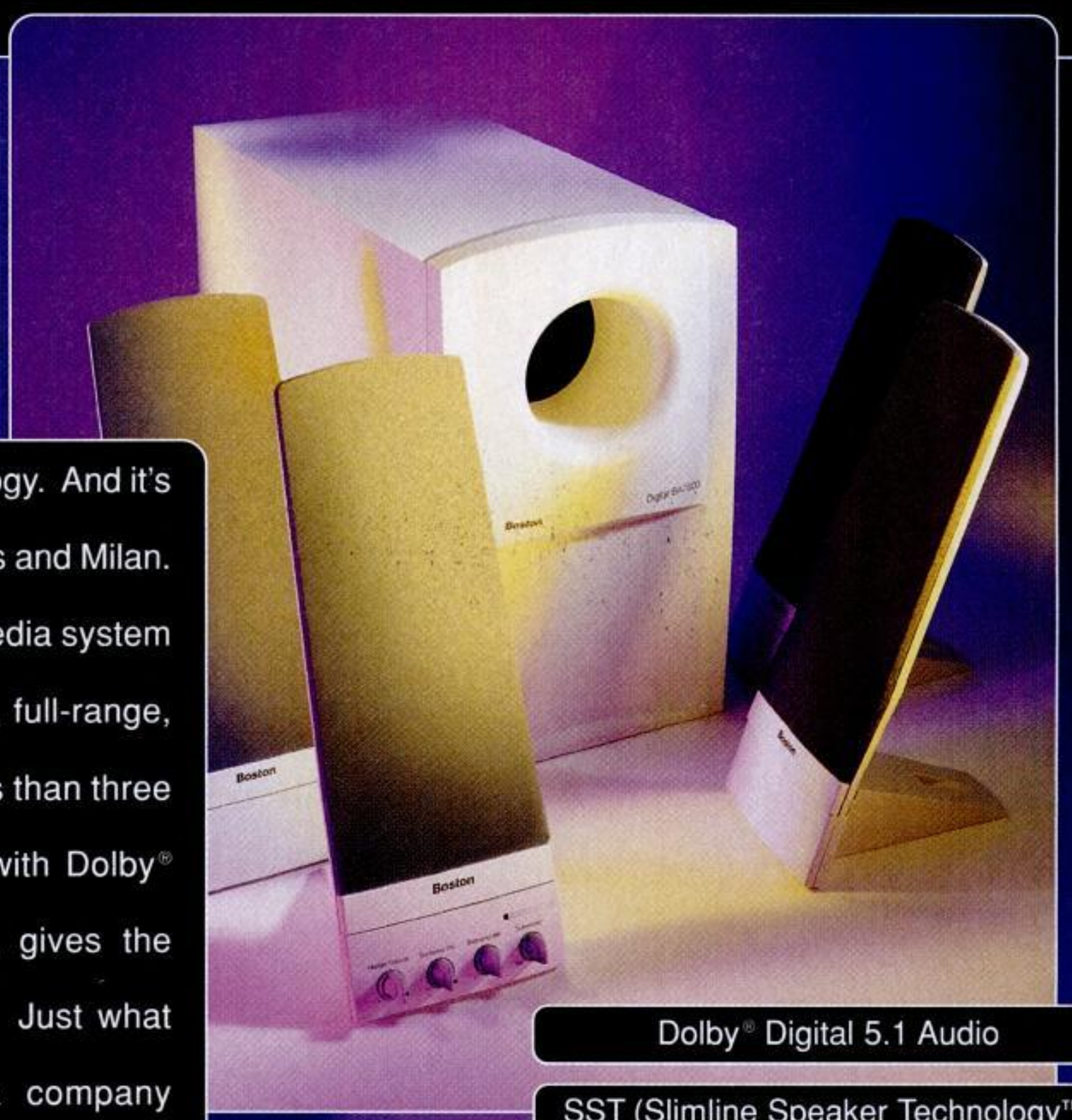
© 2000 Visa U.S.A. Inc.

Boston

DOLBY DIGITAL

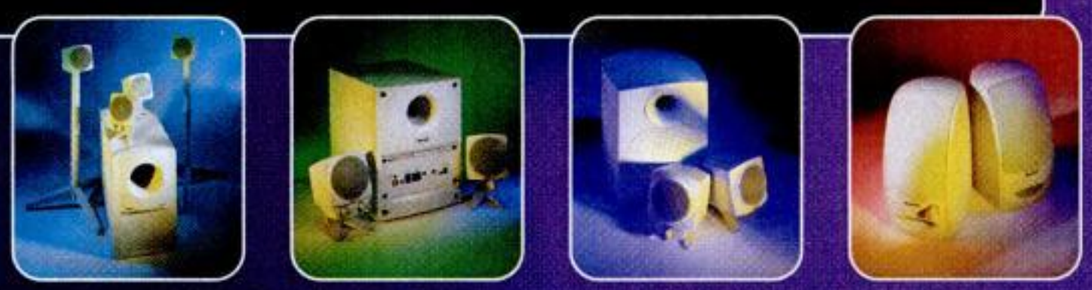
HOME CAR MULTIMEDIA CUSTOM

ITS FATHER WAS A $5,000 HOME THEATER SPEAKER. ITS MOTHER WAS A SUPERMODEL.



It sounds incredible. It's packed with technology. And it's thin enough to appear on the runways of Paris and Milan. Boston Acoustics introduces the first multimedia system using SST™ satellites. The result: dynamic, full-range, high-fidelity sound from a satellite that's less than three centimeters thick. The Digital BA7500™, with Dolby® Digital, SST, and 4-channel compatibility, gives the PC gamer a big shot of audio adrenaline. Just what you'd expect from Boston Acoustics, a company with over two decades of loudspeaker expertise. To learn more about the Digital BA7500, visit www.bostonacoustics.com. Its parents would be so proud.

- Dolby® Digital 5.1 Audio
- SST (Slimline Speaker Technology™)
- 4-Channel PC Gaming



Buy Now

www.bostonacoustics.com

Also available at most electronics and home computing stores.

For a complete Boston Multimedia story, visit www.bostonacoustics.com or order now toll-free, 1-877-333-4001.

© 2000 Boston Acoustics, Inc. All rights reserved. Digital BA7500, Slimline Speaker Technology, and SST are trademarks, and Boston Acoustics and Boston are registered trademarks of Boston Acoustics, Inc. Dolby Digital is a registered trademark of Dolby Laboratories.

Boston

Copyrighted material

TOTAL RECALL

What are they seeing in Peoria?

Many of you have caught on to the fact that some of our issues are not like the others when it comes to the covers. You're right—sometimes, we'll send out the same issue with two different covers. Why? Not so you'll feel compelled to buy two copies of the issue—although some of you have accused us of this. It's actually for research purposes. "Split-cover runs," as they're called, are used to find out whether one sort of cover sells better than another. In the case of our August and September issues, the question was whether a cover graced with an illustration sells better than a cover with a photograph, and how a cover heralding a product roundup fares against a cover detailing a "celebrity product." These little experiments are generally done over two consecutive months, in hopes of gathering as much data as possible. Subscribers all receive the same cover—it's only newsstands that receive differently clothed mags, and no newsstand should ever have both copies available. Which cover was available at your local Piggly Wiggly depends on which state you live in.

Some of you felt so strongly about the different covers, we half expected you to show up at our doorstep (that is not an invitation). You thought you were missing something, or that you'd been denied an extra issue. Rest assured, the covers may be different, but the content inside is the same. If you received or purchased August and September issues of *Maximum PC*, you got whatever there was to get. But if you happen to have seen both covers, feel free to let us know which one you prefer.

Simpatico SMP?

I just picked up the September mag and found one small problem with your choice of CPUs in Dream Machine 2000: 1GHz Intel CPUs aren't SMP compliant. I don't know if this would prevent a system from running, but I would definitely be curious as to what effect it could have. Unless, of course, your CPUs have different S-Codes. If you have somehow received newer ones, please let us know which S-Codes they have.

—Mike Borduas

We've been successfully running the dual 1GHz Dream Machine for over two months now.

Senior Editor Gordon Mah Ung responds: We never said it was a *real* PC—that's why it's called a *Dream* Machine! Just kidding. The idea that 1GHz CPUs won't run in a dual-proc configuration is similar to the idea that P-PGA Celerons are "uniprocessor" only—that is, both statements appear to be untrue. We've been successfully running the dual 1GHz Dream Machine for over two months now, without any problems beyond the normal Windows issues. We should also mention that our OR840 board isn't qualified for speeds beyond 866MHz. Nonetheless, it works fine. For the record, our CPUs are both SL4FP versions.

Keep in mind that Intel must be extremely conservative in published information about its products. If it certifies that a CPU will run in SMP, it must run in SMP. It's possible that Intel isn't getting all of its yields to run at 1GHz, and, because of that, it won't qualify them.

Serial ATA Is on Its Way

In your August 00 issue, the review of "Freaky Fat Hard Drives" says that the DiamondMax 60 drive "ships with UltraDMA/66 support, and though we were initially informed that an upgrade to UltraDMA/100 would be possible via firmware update, we're now told to expect that capacity out of the box." Does this mean that those DiamondMax 60 drives shipping now have the UltraDMA/100 already enabled? What about drives that have been on the shelves for the last couple of months? Can the firmware be upgraded on them? Were they originally shipped with the UltraDMA/100 enabled or are the people that already purchased those drives out of luck? And will UltraDMA/100 offer much in the way of a significant drive performance increase?

This brings me to my next set of questions. UltraDMA/100 is extremely new to the market, but I keep hearing that Serial ATA is just around the corner. How far are we from Serial ATA? Will Serial ATA be backward-compatible with existing drives? Will Serial ATA have the same distance limitations as IDE? Will the UltraDMA/100, and eventually the Serial ATA, interface come standard on motherboards or will it require an add-on card?

—Gregory J Blajian

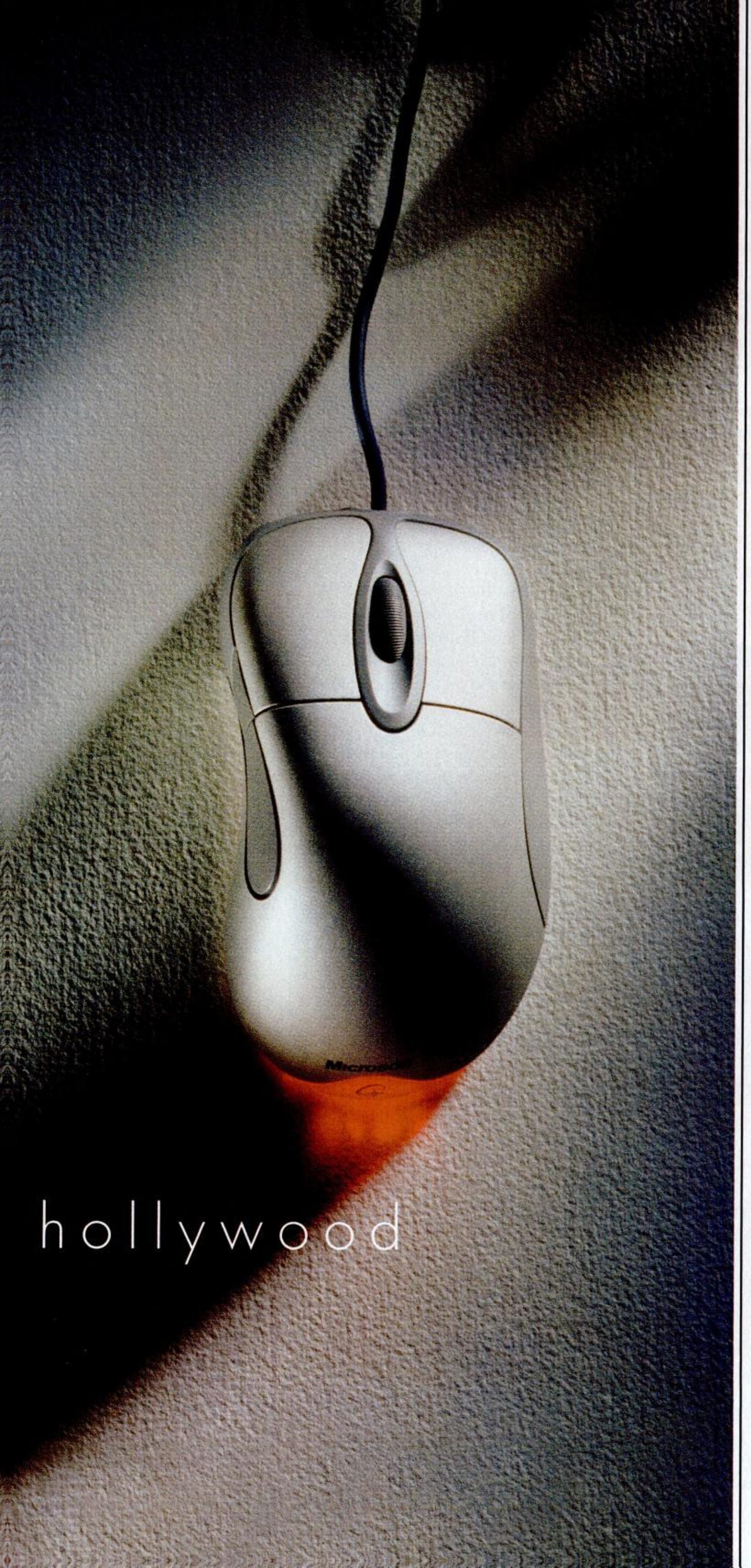
Reviews Editor Josh Norem replies: Let's tackle these questions one at a time.

First, DiamondMax 60 drives shipping now should already have ATA/100 support. Drives that have been on store shelves for a month or two will be ATA/66, but can be upgraded to ATA/100 via a firmware patch available at Maxtor's web site. ATA/100 will not offer a significant performance increase over the current generation of ATA/66 drives since no drive currently on the market is able to achieve sequential transfer rates anywhere near 66MB/sec. The ATA/100 spec allows headroom for future drive development, which makes a nice segue to your next

Editorial Policy: Maximum PC invites letters to the editor; just send 'em to commport@maximumpc.com. Please include your full name, home town, and telephone number. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

CHECK IT OUT Online
www.maximumpc.com

Copyrighted material



question regarding Serial ATA.

There will be a new standard, called Serial ATA, implemented around mid-2001. Some people think ATA/133 will follow ATA/100, but at this point, that's merely speculation. The primary difference between the current parallel ATA standard and Serial ATA will be the replacement of the 40-pin, 80-conductor ATA cable with a ribbon-like, 4-wire serial connector that uses two wires for writes and two wires for reads. The new cable design uses less voltage with a lower pin count than the notoriously fat ATA cable and has a distance limitation of one meter (3.28 feet)—a significant improvement over ATA's 18-inch cable limitation.

However, the new specification involves more than just a cable-swap; in fact, it will allow for a significant increase in bandwidth over the ATA spec. Intel plans to launch Serial ATA 1x with a maximum throughput of 1.5Gb, which translates to a maximum data transfer rate of 150MB/sec. Rumor has it that the technology will scale to over 500MB/sec over the course of the next five years. Serial ATA will be backwards-compatible with ATA drives via an adapter, but will maintain the current IDE limitation of four devices per controller. Serial ATA will eventually come standard on motherboards, just like ATA does now.

Protecting the Home Front

Several times, I have caught my Dad visiting certain Internet sites and downloading certain movies that he shouldn't be. Both my Mom and I are very worried about him, his marriage, and our family. I was wondering, what is the best filtering software out there? I've looked at a few, including *Eyeguard*. So far, I like the idea of *Eyeguard* quite a bit, but I can't get them to send me a trial version. What I'm looking for is some software that blocks the bad pictures, not the entire site. *Eyeguard* seems to do just that, but I don't know how effective it is. Please let me know if

Copyrighted material

any decent skin-tone filtering systems actually exists. Thank you much.

—name withheld

Features Editor Kristen Salvatore responds: *Eyeguard* will definitely address one of your requests—it will block pictures that show lots of skin. You simply set skin-tone tolerance levels, and if an image trips *Eyeguard*'s wire, so to speak, the image content will be obliterated by an *Eyeguard* blocking label. But it sounds like what you're really looking for is a way to talk to your dad about what's going on. We're not experts on this sort of thing, but we want to be sure you understand that talking to your pop and blocking his online activities are two different things. Blocking the nudie pix does nothing but keep your dad from seeing bare breasts on his computer screen. If you want your dad to actually address the bigger problems, you (or someone else) will have to talk to him about it. In any case, we wish you the best of luck with what sounds like a tough situation (and we feel compelled to remind you that there are lots of free counseling resources available, online and in your community, if you want some help with it).

DVD-to-TV for Me?

I've been pondering the idea of installing a DVD drive in my computer and hooking it up to my television. I thought about passing a cable from my computer, which is in one room, to my television, which is in another room, via a videocard with TV-out. Then I found out that the cable length is very restrictive and that there's a loss of signal beyond a certain length. How long a cable can I use with a Hollywood Plus MPEG decoder card before there's signal degradation?

—Gaetan LeClair

Reviews Editor Josh Norem replies: When discussing cable length limitations for MPEG signals, you have to consider the type of signal.

Copyrighted material

Hollywood Plus MPEG decoders offer two types of output: S-Video and Composite. S-Video, which stands for Super-Video, divides the video signal into two separate signals—one for color and one for brightness. Because televisions are designed to display separate signals for color and brightness, S-Video tends to produce higher-quality television output than Composite video signals, which are sent as single, unified signals (hence the name "Composite").

Both S-Video and Composite are analog signals that travel in wave form, which means that, in both cases, as the length of the cable increases, the strength of the signal is degraded—but one will degrade sooner than the other. Based on what we've heard from engineers at Sigma Designs and Utobia, S-Video cables have a distance limitation of around 35 feet, and Composite cables have a limitation of around 50 feet. That doesn't mean that cables exceeding these lengths won't transmit the signal, but it's likely that the signal will suffer degradation, resulting in picture quality that's marked by ghosting effects, fuzziness, or other anomalies.

Keeping It Down

I read your article about reducing the noise from your computer, and I noticed that you missed one of the best options for this—I use Dynamat sound-dampening material in my tower case. It's sold in almost every car audio store. The results are wonderful. I don't know the actual sound reduction in decibels, but I think it reduces the sound output by half or more. My full tower with a 300-watt power supply used to roar like a lion every time I fired it up. Now, it just hums along quietly. The Dynamat material is heat-resistant up to temperatures of about 180 degrees, so the heat in the case isn't a problem. In fact, one of the best tips I got was to get the material very hot before applying it to the case metal (I used a blowdryer), because it helps the adhesive stick better.

—Steven Leigh

Maximum Josh

When I first bought your magazine, I thought I had finally found a publication with some guts—bikini-clad women on the front cover and hardcore articles inside. You still seem to have the no-nonsense articles, but where are my girls? I really miss those pictures. They remind me that although I love my computer and all the time I spend on it, I must still try to develop a personal life. Please bring the girls back!

—Gary Guillen

Features Editor Kristen Salvatore replies: Gary, that's the oddest coincidence! You see, we're unable to get the girls to model anymore because they told us that although they loved our magazine and all the time they spent on its cover, they needed to develop a personal life. What could we say to that? Far be it from us to stand in the way of any girl's dreams—even if it means standing in the way of some boy's, ahem, dreams. Still, you're not the first guy to write in about this, so as a concession to those readers who miss *Maximum PC*'s bikini covers, plans are being hatched to release the "Maximum Bikini" calendar featuring none other than our own reviews editor, Josh Norem, modeling the latest in sexy swimwear. It should be available just as soon as we can get him an electrolysis appointment. Let us know if you'd like to receive a complimentary copy.

There are actually quite a number of Palm shortcuts based upon the "shortcut, tap, tap, number" pattern.

Hidden Palm Secrets

On page 54 of the September issue ("Palm Apps"), you describe an app called LightHack that you found useful because you believe Palm doesn't give users a choice concerning their PDA's backlighting scheme. This is actually untrue. You have two choices (inverted or otherwise), if you know how to access them:

1. Tap Find.
2. Type in "shortcut" (as if you were drawing a picture of a bow).
3. Tap the period twice.
4. Write the number 8 in the "number" area. This should yield an "Inverting Backlight" message.

There are actually quite a number of Palm shortcuts based upon the "shortcut, tap, tap, number" pattern. Most of them aren't public knowledge, but I thought you might want to know.

—Jan Mahler

Someday, They'll Be on Your Payroll

I'm a happy subscriber to your magazine, but one thing bothers me about it: You guys call yourselves, and other computer extremists, "geeks" and "nerds." I know it's not in a derogatory way, and maybe it's carried over from what the jocks called you in high school or something, but the only real difference I see is that the so-called "geeks" will be making about 10 grand more a year than the pretty boys.

—George Johnson

Power Supply Problems

In the "OEM Interrogation" article in your August issue, the representative from Dell Computers claimed that he has "data that shows that we're not getting any phone calls about inadequate power supplies." That is absolute bull. There are many messages on Dell's own support message board about people having to go out and buy new 300-watt power supplies for their machines because of random system lockups that mysteriously disappeared after the new power supplies were installed. The reason Dell isn't getting any phone calls is because Dell technicians incorrectly diagnose the problems—and because most people give up because of the hour-wait tech-support phone calls. Just thought you'd be interested to know the other side.

—Markmarconious

Rambus Videocard

Have you ever heard of DRDRAM?

—John Ivy

Copyrighted material

Technical Editor Will Smith responds: DRDRAM is simply Direct Rambus Dynamic Random Access Memory, the same memory that Intel has been so fond of lately. We have seen Direct RDRAM in video hardware (most notably the Nintendo 64), but haven't seen it in any mainstream videocards. Well, that's not quite true. We do have the Newcom Dash, equipped with 4MB of 600MHz Direct RDRAM. Newcom claims that the inclusion of Rambus technology makes everything faster, cranking up 2D performance by as much as 30 times. Don't rush out to grab this card quite yet, though—it's powered by a chipset from 3D juggernaut Cirrus Logic and was released in 1996.

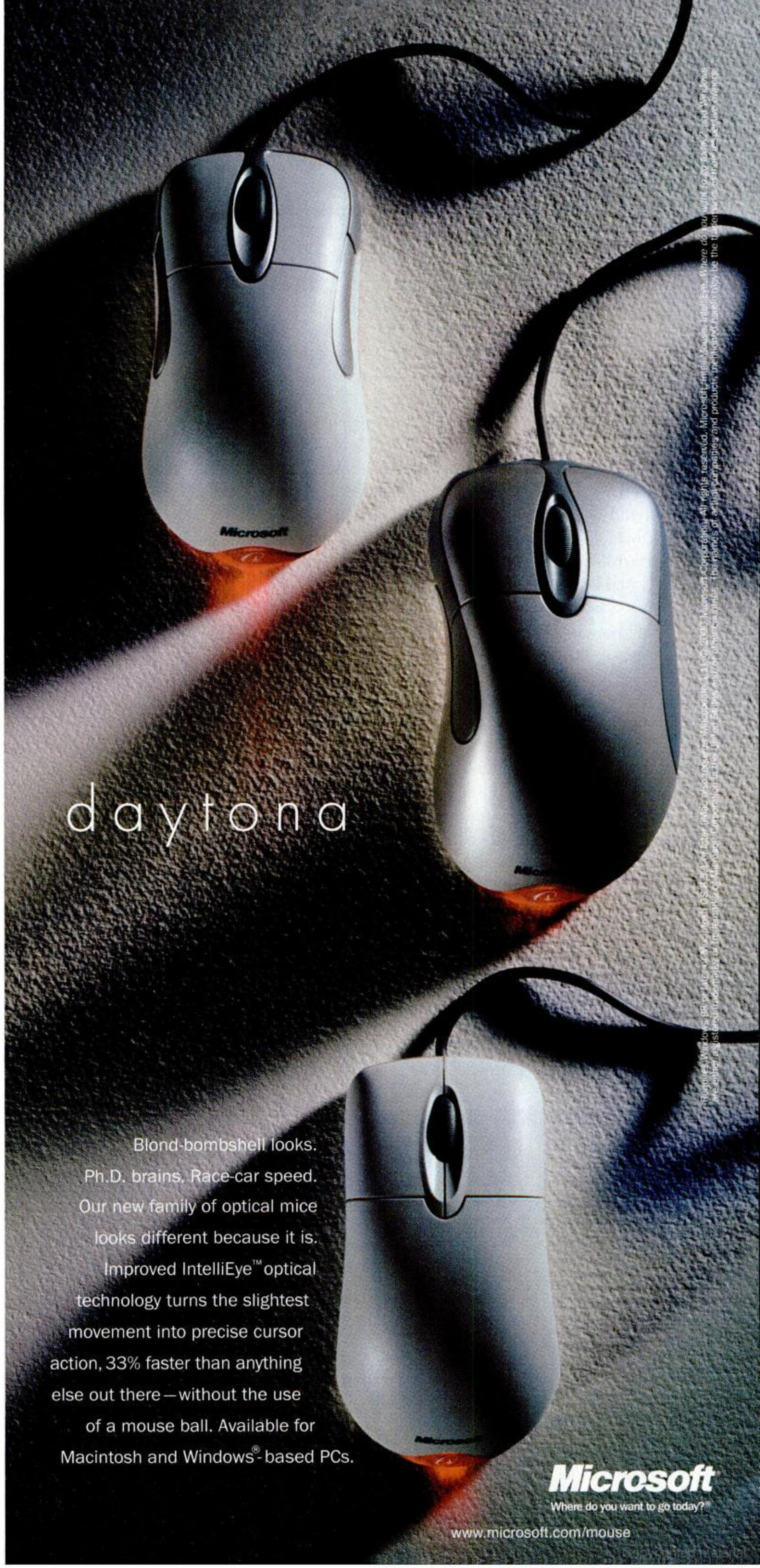
A little birdie told us that some big 3D-chip manufacturers have been looking at Rambus as a way to bypass the memory bottlenecks that high-end accelerators suffer from. ✹

This Cirrus Logic4MB beauty is the first Rambus-powered videocard we've seen.

CUT COPY PASTE

▶ In our September issue, the price of the Olympus Eye-Trek FMD-150W-US glasses was accidentally listed as $90. The actual price is $900. In the same issue, the price of Dream Machine 2000 was reported as $11,987, when in fact the machine cost $12,097 (including the cost of the previously untallied power supply). We apologize for the errors.

▶ On page 86 of our August issue, we failed to mention the complete title of Utobia's full-screen MPEG decoder card. The appropriate name for the card is Full Screen DVD Motion (Real Magic) MPEG-2 playback card.



Beyond Today's Broadband

Coming Soon: 100Mbps Download Speeds

Think your cable or DSL speed makes you a badass? Think again. Numerous companies are hard at work on technologies that will make today's broadband seem like a 1,200 baud modem.

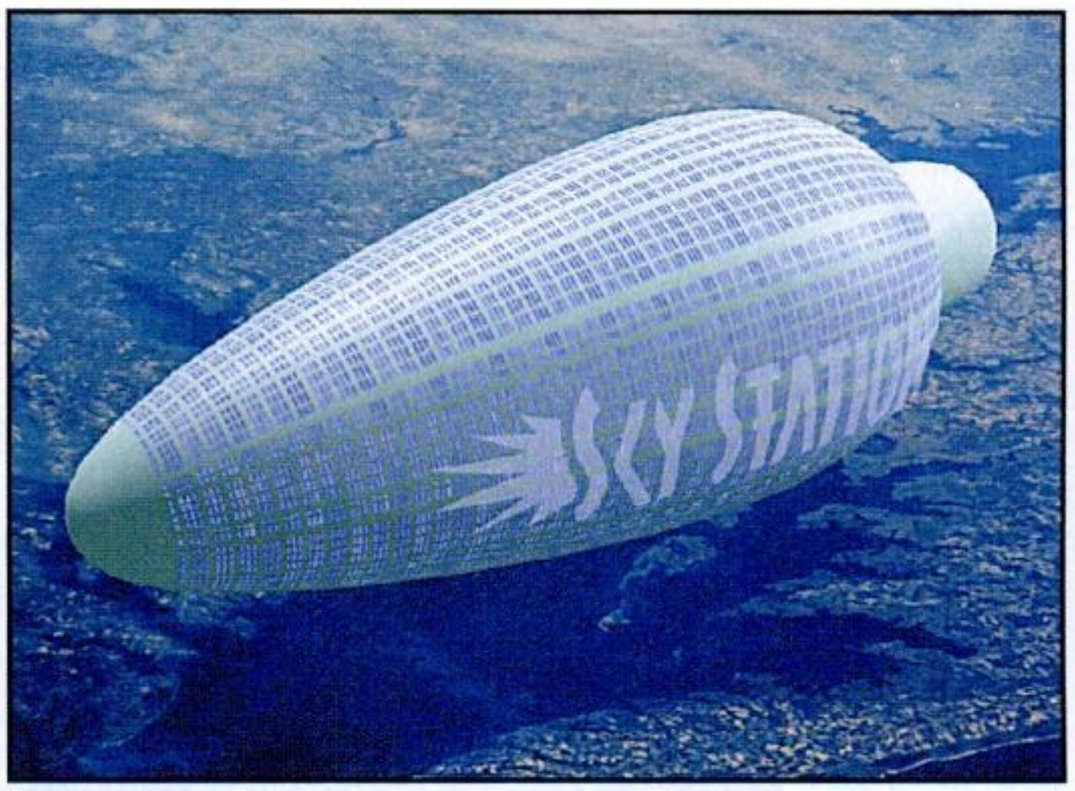
From high-tech blimps broadcasting from distant orbits to 100Mbps fiber connections feeding directly into your home, broadband service providers are stepping on the bandwidth accelerator.

And it's a ripe market. Right now, about 80 percent of all Internet connections are made by ordinary analog modems. By 2003, 40 percent of all Internet users may have access to some form of broadband technology.

Many fat pipe connection schemes are waiting in the wings. Some, such as Sprint's fixed wireless broadband service and Hughes' Satellite DirecPC, are already commercially available in some metropolitan areas. Others, such as 100Mbps "Cable to Home/Cable to Curb," are the subjects of small, controlled tests by Sprint and Bell South. And last but not least, Alexander "I'm in Charge" Haig is now the CEO of Sky Station International, a company that promises to launch "lighter-than-air" platforms for Internet broadcast by 2002.

These technologies all hold the promise of "greater-than-DSL" bandwidth for a widening number of Internet subscribers. But don't sell your stock in AT&T just yet. Most analysts believe that wireless technology won't supplant residential cable or DSL in American cities. Instead, alternate broadband schemes will build up steam by reaching into markets and geographic regions where DSL and cable are impractical.

DSL availability is contingent on the telephone wiring in your neighborhood and your proximity to the telephone company's central office. ADSL (Asymmetric DSL), the most popular flavor, can reach subscribers within a radius of 12,000 to 18,000 feet, at bandwidths from 384Kbps to 2Mbps. But the practicality of getting DSL into your living room is affected by line conditions, wire size, and wire quality. ADSL doesn't work if the wiring between your house and the central office uses repeaters, wiretaps, or loading coils.



High-tech unmanned blimps above your city may eventually connect you to the Internet at up to 10Mbps.

Another DSL flavor, iDSL (ISDN-like DSL), can travel over repeaters at distances of up to 35,000 feet from a central office. But iDSL bandwidth is currently capped at a pathetic 144Kbps.

Cable modem speeds are generally faster than those of DSL (many users report average download speeds between 1Mbps and 3Mbps), but the problems with cable modem availability tend to be more political and economic than technical. Cable service is an arena dominated by large telephone companies and their affiliates. Regional Internet Service Providers tend to be shut out of the cable market, although legal battles are being fought over this issue in a number of cities.

Broadband analysts speculate that alternate Internet technologies will eventually succeed by reaching consumers before the competitors do or by being more cost-effective and practical than DSL or cable. Sprint's wireless Broadband Direct service is one such example, providing Internet access through a 2.5GHz radio

SPIN CYCLE

This month's top stories broken down ▶

HEADLINE	NEWS	DETAILS	THEIR SPIN	OUR TAKE
Intel Supports SDRAM with P4	Reversing its previous stance, Intel says it will add support for PC133 SDRAM to the Pentium 4 chipsets.	Intel will continue to push RDRAM for performance PCs, but will also cater to OEMs who want to use cheaper SDRAM in systems.	The company says it needs to have an option for ultra-budget systems.	In reality, Intel is afraid that the price of RDRAM memory will tank P4 sales.
Sledgehammer vs. Itanium: Fight!	Following the adage, "Evolution, not revolution," AMD says it has released a programmers' guide for its new Sledgehammer x86-64 architecture.	AMD's new architecture extends the existing 32-bit code base while allowing developers to write applications that need loads of RAM.	"[The Sledgehammer] leverages the billions of dollars invested in existing software," says AMD.	Everyone wants a fight to the finish, but we predict there's enough room for both Itanium and Sledgehammer to do well.

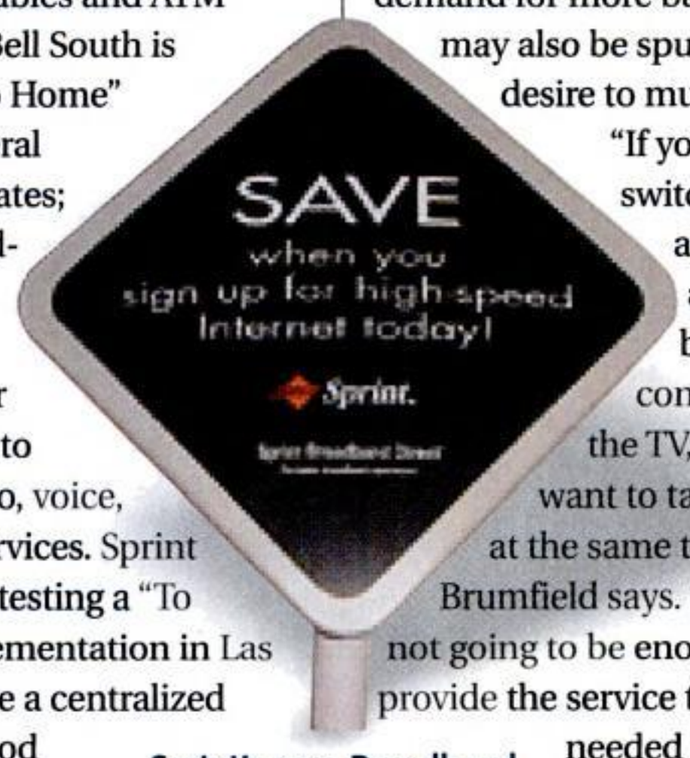
Copyrighted material

signal and a technology called Microwave Multipoint Distribution. A small, 13.5-inch, diamond-shaped antenna is mounted on the roof of the customer's home, pointing toward a centralized transmission tower. The antenna is also wired to the computer's broadband modem. Signals can be received at bandwidths of up to 5Mbps at distances of up to 35 miles from the tower. The planned monthly rate for residential Broadband Direct is comparable to DSL—about $40 per month—but it offers better bandwidth at 1Mbps downstream and 256Kbps upstream. The system currently has about 5,000 subscribers in Phoenix and Tucson; Sprint executives say they expect to roll out the service in 20 cities by as early as December 2000.

Broadband Direct's obvious advantage over cable and DSL is that it doesn't require wires for installation or tweaking to get it up to snuff. On the other hand, the Sprint service does require line-of-sight access to the radio tower.

If you can't point to a mountain top where the Sprint fixed station is, why not point at the sky? Hughes' DirecPC already offers speeds of about 512Kbps service via satellite. Unfortunately, Hughes' system requires that you use a modem over analog lines to transmit upstream at about 33.6Kbps. However, Internet service via satellite is expected to change dramatically within the next two years with the launching of new satellites that support both up- and downstream connections. This "Ka-Band" technology is capable of delivering data at up to a sizzling 35Mbps in both directions. Hughes, as well as iSKY, plan to launch Ka-Band satellites by the end of 2001.

If you think 35Mbps isn't enough, you'll be happy to hear that some telcos are currently in trial stages with "Cable to Curb" or "Cable to Home" systems. These promise the fastest consumer Internet access technologies available, with bandwidth of up to 100Mbps through fiberoptic cables and ATM switching. Bell South is running "To Home" tests in several Southern states; each individual residence gets its own fiber connection to handle video, voice, and data services. Sprint is currently testing a "To Curb" implementation in Las Vegas, where a centralized neighborhood node provides connections to a group of customers.



Sprint's new Broadband Direct will offer up to 5Mbps through fixed broadcast stations.

Industry observers believe that broader rollouts of fiber cable to the curb and to the home are two to three years away.

If you think that 100Mbps is more Internet bandwidth than anyone can possibly use (most of the Internet now runs between 1Mbps and 5Mbps on T1 and T3 lines), think again. Most broadband analysts tend to agree with the *Maximum PC* crowd: There's no such thing as too much speed.

Realtime streaming video, for example, requires 3Mbps for standard TV resolutions and higher resolution video, such as that in HDTV or DVD, will require much more.

Cynthia Brumfield, editor of the *Broadband Intelligence* newsletter, says that the demand for more bandwidth may also be spurred by the desire to multitask. "If you have a switched video application and a broadband connection to the TV, you might want to tape and talk at the same time," Brumfield says. "1Mbps is not going to be enough to provide the service that is needed for that single household."

Patti Reali, a senior analyst at Dataquest who covers broadband, says gamers are championing the need for fat pipe connections.

"In Asia…'PC Bangs' are stripped-down Internet cafés where teenagers game through high-speed cable connections," Reali says.

Believe it or not, companies are already laying plans to exceed even 100Mbps connections. Lucent's Optical Lightwave system promises an incredible 10Gbps with its WaveStar One by as early as the summer of 2001.

The wackiest concept out there may be Alexander Haig's lighter-than-air orbital platforms—essentially high-tech unmanned blimps that can sit in the stratosphere and provide people with up to 10Mbps of Internet access. The blimps will be solar and fuel-cell powered, and hover in the sky from five to 10 years. Though it sounds nutty, analysts say the blimp idea may make sense in areas where economic and political concerns make running cable or fiber lines impossible.

So watch the skies and keep your ear to the ground—and be wary of getting locked into a two-to-five year analog ISP account when you buy a new computer. Pretty soon, things are going to get much faster—and much more interesting.

—Lenny Bailes

to the pertinent details.

HEADLINE	NEWS	DETAILS	THEIR SPIN	OUR TAKE
VIA Unveils HDIT	To feed its new DDR memory chipsets, VIA will implement a new interconnect architecture early next year.	High-Bandwidth Differential Interconnect will offer up to 4.2GB/sec bandwidth for memory-to-CPU and AGP-to-memory operations.	"The 32-bit, 33MHz PCI bus, with a peak bandwidth of 133MB/sec, is no longer sufficient," says VIA.	To keep up with the P4's 400MHz bus, VIA must up the speeds. Hopefully, HDIT and V-Link will be out on schedule early next year and will actually work.
Sam 2 To Hit 1GHz	VIA says that, next year, it plans to introduce a sequel to the budget Samuel chip in the 1GHz range.	Samuel 2 is intended for Internet appliances and notebooks and will be fabbed using a 0.15-micron process.	VIA says the chip will "expand" its markets.	VIA's continued push for faster CPUs will eventually cause AMD and Intel to turn their backs on the company.

Copyrighted material

(Hint: It's a Food Processor)

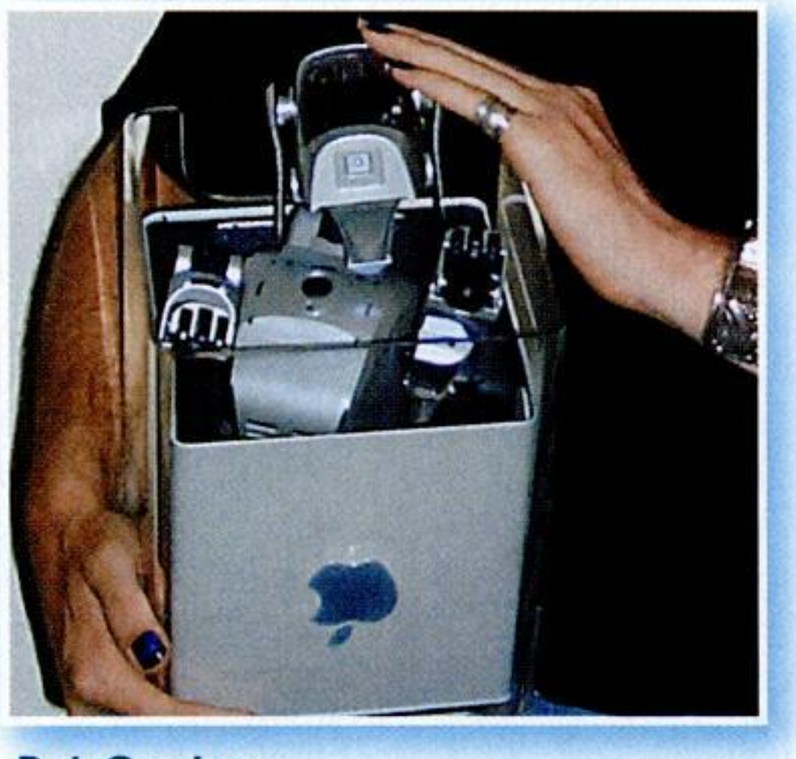
Eight Alternative Uses for the Power Mac G4 Cube

Apple calls its latest precious thingamabob a "supercomputer." We call it a Mac that's been debased by a painfully outdated Rage 128 graphics chipset. Next month, we'll officially review Apple's exciting dual-proc G4 and 22-inch Cinema Display, but this month we present eight likely uses for the G4 Cube.ß

—Jon Phillips

Camping Stove

If you're willing to hold your pan o' pork over the Cube's heat vent for a couple of hours, you'll have a country breakfast before this baby can complete our *Quake III* benchmark!



Pet Carrier

Get in the Cube, Aibo. C'mon, Aibo, get in the Cube. Good doggy, get in the Cube…

Food Processor

Oh, no, pulverizing apples would have been just too cheeky. So we made a celery stalk puree. Blend it with SDRAM for an invigorating New Age elixir!

Head Size Gauge

The *Maximum PC* staff includes an eclectic array of head sizes, ranging from the Gordon Mah Ung Jumbo model to the Ruth Murphy Junior Petite model pictured here. We had no way of reliably measuring our head sizes until the Cube showed up. Thanks, Apple!

Tissue Dispenser

Look at that! It's a G4 Cube that doubles as a tissue dispenser. Well, heck, that's cuter than a little buttercup.

Nuclear Football

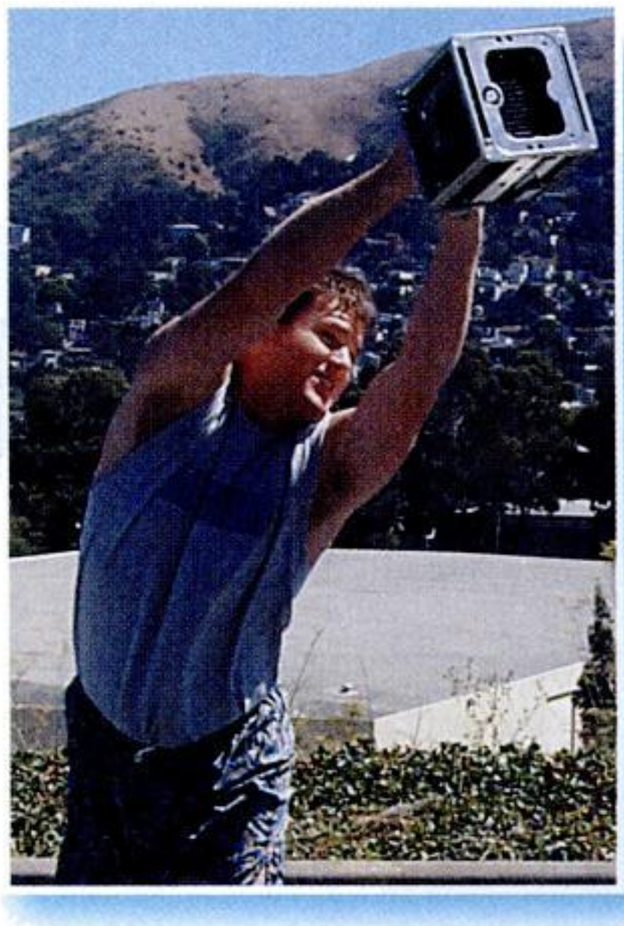
Hey, what's that spook carrying? The nuclear football? Sure, why not. We've never actually seen the nuclear football, and we doubt you have either. But we believe the nuclear football has a handle and is filled with electronic junk. Just like the "weapon of destruction" pictured here.

Hipster Handbag

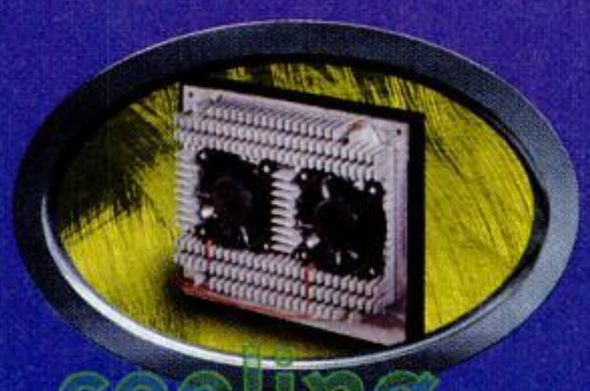
Attention all "kooky" chicks: Lunch pails are out. We repeat: Lunch pails are out. You are now instructed to tote around G4 Cubes. Thank you. That is all.

The Cube Throw

Maximum PC is lobbying the International Olympic Committee to include the Cube Throw as a demonstration event in the 2004 games. We doubt the IOC will budge—everyone knows that the rest of the world lives in fear of good old American Cube throwing might.



Copyrighted material



cooling devices

enclosures

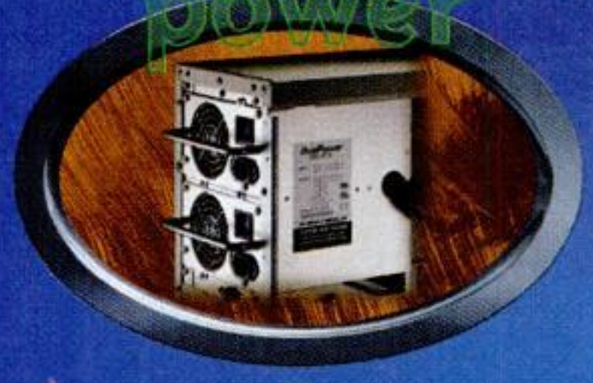
base systems

PC POWER & COOLING, INC.®

heat alarm & accessories

power supplies

redundant power



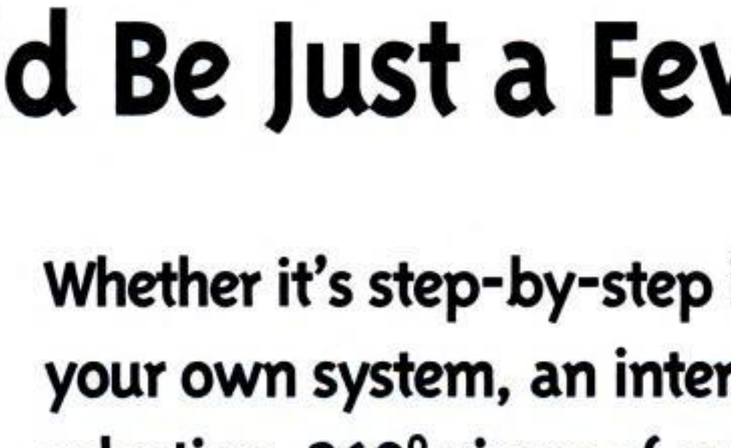
$25,000 Could Be Just a Few Clicks Away!

15th Anniversary $25,000 Sweepstakes

To celebrate our 15th anniversary, we're giving away $26,000 cash, $8,000 in PC Power and Cooling products, and a wild trip to Vegas! (See list of prizes below.) It's simple — just order online, and you're automatically entered in the sweepstakes! Winners will be posted November 15, 2000. See our website for official rules and details.

Grand Prize	• $25,000 Cash and Trip to Las Vegas • Deluxe Chrome Tower Case with a Turbo-Cool 425 ATX
First Prize	• $1,000 Cash • Deluxe Chrome Tower Case with a Turbo-Cool 425 ATX
Second Prize	• $500 in PC Power & Cooling Products (5 winners)
Third Prize	• $200 in PC Power & Cooling Products (20 winners)

Whether it's step-by-step instructions on how to build your own system, an interactive guide to power supply selection, 360° views of our pro enclosures, or a chance to win $25,000, you'll find it at pcpowercooling.com


PC POWER & COOLING, INC.
What's New
eMachine 145W power supply
The solution to a huge problem!
Dell 300W power supply
The power a loaded Dell deserves!
Standard 250 ATX power supply
Same price as the 235 it replaces!
Silencer 400 ATX power supply
Ultra-quiet and high-performance!
Turbo-Cool 425 ATX power supply
500W peak power! 1% regulation!
Bay-Cool III drive cooler
Cool, filtered air for 1-3 drives!
CPU-Cool Z1 "S" series coolers
Low-noise and ultra-reliable!
ATX power supply tester
The first universal, low-cost tester!

TEN GREAT REASONS TO SELECT THE INDUSTRY'S BEST, THE TURBO-COOL® 425 ATX AND TURBO-COOL® 600 AT/ATX.
1. 50% TO 100% MORE POWER
2. BUILT-IN LINE CONDITIONING
3. AUTO-SELECT INPUT
4. ULTRA-CLEAN DC OUTPUT
5. INDEPENDENT REGULATION
6. OVP, OCP, OTP, SC PROTECTION
7. HIGH-CAPACITY COOLING FAN
8. UL/CSA/FCC APPROVALS
9. 5-YEAR WARRANTY
10. GREAT VALUE

New Products!

Tech Info!

Celebrating Our 15th Anniversary!

www.pcpowercooling.com

(800) 722-6555 Fax: (760) 931-6988

Weekly Specials!

Online Ordering!

Copyrighted material

I don't know really how to say this, but I had a few doubts about the buzz on your new RADEON™ gamer boards. I checked out your so-called RADEON™ GPU with its integrated T&L acceleration and ultra-fast DDR to speed up my Quake™ III Arena framerates. Not only does RADEON™ have awesome high-quality performance but it supports more advanced 3D games and upcoming DirectX™ 8.0 features than any other graphics board. The DVD playback feature will come in handy when I need to take a break from gaming. And, I have to admit the video capture and TV-output option on RADEON™ 64MB DDR makes it a must-have. But, just remember, the only opinion of RADEON™ that matters is mine and I have only one thing to say to you ATI

NOW SHIPPING!

ATi RADEON GRAPHICS™

Gimme Radeon!

© Copyright 2000, ATI Technologies Inc. All rights reserved. ATI and RADEON are trademarks and/or registered trademarks of ATI Technologies Inc. All other company and/or product names are trademarks and/or registered Trademarks of the respective manufacturers.

ATi®

Visit ati.com

Copyrighted material

▶ Maximum PC takes a bite out of bad service and gear

WATCHDOG

ILLUSTRATION BY SCOTT LAUMANN

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **Watchdog @maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

KENWOOD EDGES TOWARD A SETTLEMENT

When Jeremy Gotcher purchased his Kenwood 40x40 drive from Hi-Val, he expected to get the fastest CD-ROM drive on the market. Instead, Gotcher told The Dog, the Kenwood drive refused to read most of his CD-Rs and, when a store-bought CD-ROM was inserted, the drive took an ungodly amount of time to spool up. "There was just a lot of quirkiness," Gotcher said.

A lot of quirkiness, indeed. Many *Maximum PC* readers reported peculiarities with the 40x40 Kenwood drives. Readers claimed that, at times, the drives would fail to be recognized by their PCs, disappear from Windows, vibrate enough to shake the entire system, and read only one out of 10 discs.

Is your 40x40 drive dead? Kenwood may replace it with a 72x drive.

Gotcher eventually hooked up with Philadelphia attorney Jonathan Shub, who filed a class-action suit on behalf of 40x40 drive owners. The suit alleges that the drives were defective, and accuses both Kenwood and Hi-Val of defrauding their customers by using misleading advertising. In a nutshell, the suit accuses both Kenwood and Hi-Val of shoveling a defective product on consumers.

In early August, a superior court judge gave preliminary approval to a settlement that should satisfy some Kenwood drive owners. According to Shub, Kenwood has agreed to pay to have consumers' 40x40 drives shipped back to Kenwood and tested to determine if the drives are OK. If a drive passes the inspection, Kenwood will ship the drive back. If a drive does not pass the inspection, Kenwood will replace it with a 72x Kenwood drive (worth about $130 retail). If consumers elect to not send their drives in for testing, they may be eligible to receive a $50 coupon toward the purchase of any Kenwood USA equipment. If you're worried about Kenwood having control over the testing process, keep in mind that the tests were set up as part of the settlement and approved by an expert retained by Shub.

The settlement applies only to the 40x40 Kenwood drives, not the company's 52x lineup. Though The Dog has received some complaints about the 52x drives, many readers say they are satisfied with the reliability and speed of the product.

The judge's preliminary approval clears the way for Shub to notify owners of the 40x40 drives about the settlement. Shub told The Dog that announcements will be printed in *USA Today* as well as *Maximum PC*. A court hearing to finalize the settlement is scheduled for October 30. Though it's unlikely, the judge could decide at that point to trash the settlement if he believes the class is getting a raw deal. If the settlement gets final approval, owners of the drives will have until December 15 to submit their claims. More information will be made available on Kenwood's site (www.kenwoodtech.com/40xcdromsettlement/) and, of course, published here.

Gotcher told The Dog that even though he's since purchased a Plextor CD-ROM, he'll likely swap out his defective 40x40 drive for the 72x version.

SMART AND FRIENDLESS UPDATE

The Smart and Friendly story may have finally taken its last gasp of air. Smart and Friendly, which was liquidated by its creditors in June, sold the bulk of its inventory of CD-R/RW drives to a company that resold the drives to stores. Because there's no warranty replacement or repair available through Smart and Friendly, many of the stores have agreed to offer their own warranties on the drives. Stores will either retain a portion of the inventory to replace problem drives, or sell the drives "as is." Some stores may sell the Smart and Friendly drives at full price and simply replace any defective units with another brand.

"Many Maximum PC readers reported similar peculiarities with the 40x40 Kenwood drive"

Of course, there will be some stores that pawn off the drives to unsuspecting consumers without offering any kind of discount and without notifying them that Smart and Friendly has folded. To avoid getting a 12x burn, The Dog recommends that you get a written statement from the vendor regarding the warranty status before buying a Smart and Friendly drive. Those whose drives were in for repair when Smart and Friendly went under should receive their equipment back soon, most likely in the same condition in which it was sent in. The company that purchased the Smart and Friendly assets agreed to ship the equipment back to the

Copyrighted material

SUMMARY NOTICE OF SETTLEMENT

TO: ALL PERSONS OR ENTITIES WITHIN THE UNITED STATES WHO PURCHASED NEW, FOR THEIR OWN USE AND NOT FOR RESALE TO OTHERS, A HI-VAL MULTIBEAM 40x40 CD ROM DRIVE, ALSO KNOWN AS A TRUE X™ 40x40 CD ROM DRIVE, MANUFACTURED BY KENWOOD TECHNOLOGIES (USA), INC. ("KENWOOD") AND DISTRIBUTED BY HI-VAL, INC. ("HI-VAL"):

THIS SUMMARY NOTICE IS GIVEN TO INFORM ALL POTENTIAL CLASS MEMBERS OF A PROPOSED SETTLEMENT OF AN ACTION THAT MAY AFFECT THEIR RIGHTS. PLEASE READ THIS SUMMARY NOTICE CAREFULLY AND IN FULL.

IF YOU PURCHASED WITHIN THE UNITED STATES, FOR YOUR OWN USE AND NOT FOR RESALE, A HI-VAL MULTIBEAM 40x40 CD ROM, ALSO KNOWN AS A KENWOOD TRUE X™ 40X40 CD ROM DRIVE, YOU MAY BE A MEMBER OF THE CLASS AND YOUR RIGHTS WILL BE AFFECTED BY THE PROCEEDINGS IN THIS ACTION. IF YOU ARE A MEMBER OF THE CLASS DESCRIBED ABOVE AND YOU DO NOT REQUEST EXCLUSION FROM THE CLASS, YOU WILL BE A "SETTLEMENT CLASS MEMBER" IF CERTIFICATION OF THE CLASS IS FINALLY APPROVED.

NOTICE IS HEREBY GIVEN that a hearing will be held before the Honorable David A. Garcia of the Superior Court of California for the County of San Francisco, located at 400 McAllister Street, San Francisco, CA, 94102, on October 30, 2000, at 9:30 a.m. to determine: (1) whether the proposed settlement of the Action on terms set forth in a Settlement Agreement and Release dated August 1, 2000, is fair, reasonable and adequate; (2) whether a settlement class should be certified; (3) whether the Court should enter the proposed final judgment; and (4) whether the application of counsel for the class for an award of attorney's fees and expenses in an amount up to $280,000.00 should be granted.

DESCRIPTION OF THE ACTION

The Class Representative in this Action alleges that Kenwood made misrepresentations and false statements in connection with the marketing and sale of the Hi-Val Multibeam CD ROM Drive or TrueX™ 40x40 CD ROM Drive. Kenwood has denied these allegations and alleged numerous affirmative defenses.

DESCRIPTION OF THE SETTLEMENT

Settlement Class Members may receive $50 coupons if they submit a valid Claim Form declaring under penalty of perjury that they purchased a 40x40 CD ROM Drive that failed to perform properly, together with an acceptable proof of purchase of the 40x40 CD ROM Drive. The coupons will be good for 12 months from issuance, are fully and freely transferable, and may not be aggregated. Coupons may be redeemed by mailing them to Kenwood with proof of purchase, *i.e.*, a cash register receipt from a retailer of an item from the Home Audio Line of products of Kenwood USA Corporation or a product of Kenwood Technologies (USA), Inc.

If a Settlement Class Member elects not to apply for a coupon, he or she may ship to Kenwood, at Kenwood's expense, his or her 40x40 CD ROM Drive for testing, together with a valid Claim Form requesting such testing. If the 40x40 CD ROM Drive is determined not to be performing properly, Kenwood will ship to the Settlement Class Member, at Kenwood's expense, a 72x TrueX™ CD ROM Drive, with a warranty equivalent to that provided with a purchase of a new 72x TrueX™ CD ROM Drive. If the 40x40 CD ROM Drive is performing properly, Kenwood will return it to the Settlement Class Member at Kenwood's expense with the test results.

HOW TO RECEIVE SETTLEMENT BENEFITS

If you are a Settlement Class Member, you must submit a Claim Form on or before December 15, 2000. To receive a Claim Form and a copy of the detailed "Notice of Pendency and Proposed Settlement of Class Action" (the "Notice") which describes the Action, the proposed settlement, and the rights and options available to Class Members, please mail, e-mail or telephone your request to the Kenwood Settlement Administration Center, c/o Rosenthal & Company, P.O. Box 6156, Novato, CA 94948-6156, mhanken@rosenthalco.com, 1-800-207-0343. Please include your name and address with your request. You may also download the Claim Form and Notice from the following web site: http://www.kenwoodtech.com/40xcdromsettlement/ .

REQUESTS FOR EXCLUSION AND OBJECTIONS

Any requests for exclusion from the proposed settlement must be sent by mail to Jonathan Shub, Sheller, Ludwig & Badey, 1528 Walnut Street, 3rd Floor, Philadelphia, PA 19102, postmarked on or before October 16, 2000. Rights regarding exclusion are fully explained in the "Notice of Proposed Class Settlement."

Any objections to the proposed settlement must be filed with the Court (reference Gotcher v. Kenwood, et al., case number 306311) and copies sent by certified mail to Jonathan Shub at the above address and to Arne D. Wagner, Morrison & Foerster, 425 Market Street, San Francisco, California 94105 postmarked on or before October 16, 2000. The procedure for making an objection is fully explained in the "Notice of Proposed Class Settlement."

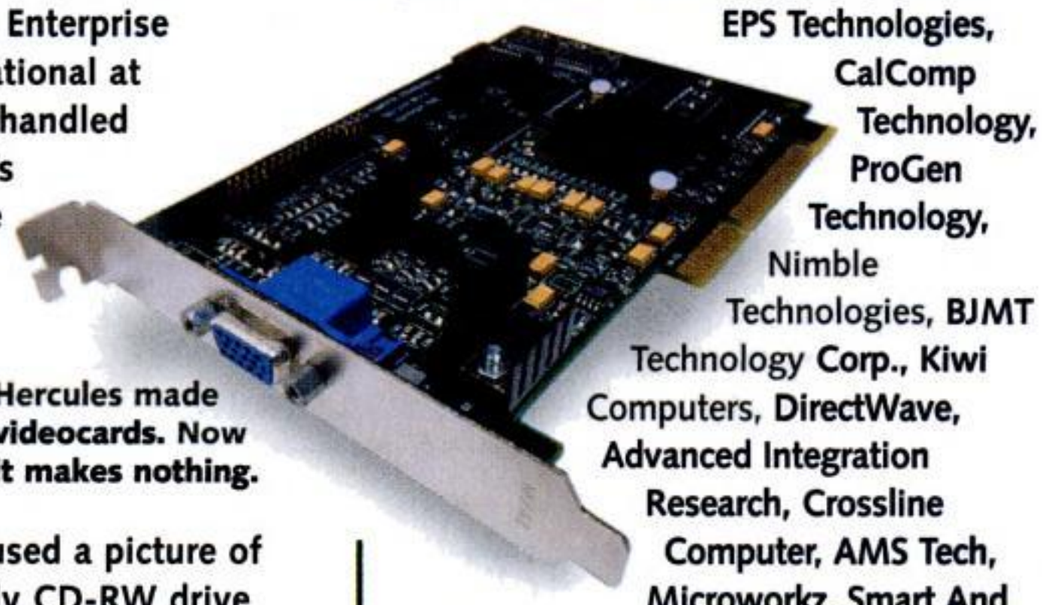
DO NOT CONTACT THE COURT OR THE CLERK'S OFFICE FOR INFORMATION.

DATED: August 1, 2000

WATCHDOG

owners, as is. At press time, no one had offered any paid repair or warranty service on those drives, but The Dog will let you know.

For those seeking tech support for their Smart and Friendly drives, relief is available though Enterprise Corporation International at 800.592.9448. ECI handled Smart and Friendly's tech support before the company went belly-up. Support calls run $30.



Hercules made videocards. Now it makes nothing.

On an unrelated note, in the August issue of *Maximum PC*, we used a picture of a Smart and Friendly CD-RW drive sitting on top of a Plextor CD-RW drive to accompany a story about Smart and Friendly's demise. Several readers have since asked us if Plextor is in trouble. For the record: Plextor is in no way associated with Smart and Friendly and, to The Dog's knowledge, is in no danger of disappearing. Woof.

The Dog recommends that you avoid Smart and Friendly-branded hardware...

BUYER BEWARE

Dear Dog: I thought of a good idea. With so many companies going out of business or entering Chapter 11, a handy list of them would be a great resource.

— Billy Turnbow

The Dog Responds: OK, Billy, you asked for it. The Dog has classified the companies into two categories: Killed In Action and Missing In Action. KIA is fairly self-explanatory and readers should be fully aware of the risks in buying hardware made by these companies, such as a lack of driver and tech support and warranty service. Of course, that won't dissuade all of you; even The Dog would pick up a SyJet drive for $10 at a swap meet. The MIA category is a little murkier—The Dog was just plain unable to determine the status of these companies. A final list was compiled to identify those companies that were unresponsive to The Dog's calls to help consumers. Buy from these vendors at your own risk.

KIA: JTS Corp., Avatar Peripherals/ Systems, Storm Technologies, SyQuest, EPS Technologies, CalComp Technology, ProGen Technology, Nimble Technologies, BJMT Technology Corp., Kiwi Computers, DirectWave, Advanced Integration Research, Crossline Computer, AMS Tech, Microworkz, Smart And Friendly,* Hercules,* and Number 9*

MIA: InfoPeripherals, SecureWin, NewCom, Atlas Peripherals, PC Fusion, and Aureal

DOG HOUSE: Lenoir Computer Shop, ComTrade, and Piggyback Delivery

**Assets purchased by another company*

ADAPTEC RECALLS RAID CARDS

Adaptec has recalled a small number of its Decade VI Ultra 160 SCSI cards because of a defective controller chip. The defect exists in the QLogic 12160A chips on the cards and can potentially transmit bad data to the RAID controller, which could cause SCSI bus hangs and parity errors. The affected models are Adaptec DPT Decade VI Ultra 160 SCSI RAID controllers PM-1564U3 and PM-1564U3-2U3. The serial numbers of the bum cards run from 03-000001 through 03-005599. The serial number is located on the lower right-hand corner of the card's face.

Adaptec will replace the cards and provide up to $300 for installation expenses or an additional Adaptec Ultra160 RAID card that's worth up to $450. For more details, call Adaptec at 321.207.2000.

Adaptec purchased Florida-based Distributed Processing Technology in November of 1999 and has been slowly combining product lines. According to insiders, Adaptec plans to eventually switch DPT's products over from QLogic controller chips to its own AIC controller chips.

Copyrighted material

SAMSUNG ELECTRONICS

Catch the killer performance of Samsung monitors

Experience life on the edge—the edge of technology, that is. Samsung's flat panel monitors deliver heart-thumping excitement, intense action, and outstanding performance. Multimedia capabilities, superior image quality, and perfectly flat screens leave you feeling anything but flat.

With the power of Samsung technology at work for you, you don't have to be an action hero to feel like one. Samsung's wide range of infinitely flat monitors satisfies even the most passionate thrill seekers. So, get your adrenaline pumping and experience the thrill of Samsung.

Samsung's 150Mp and 700TFT as seen in the movie Bait

The Mp Series 3-in-1 TV/computer monitors thrill audiences everywhere:

"We were looking for the ultimate monitor to be used by an ultra sophisticated secret government agency and Samsung's sleek, smooth, high tech styling made their monitor a natural for Bait."

– Jaro Dick, Set Decorator
Bait

JAMIE FOXX

BAIT

in theaters September 15, 2000

www.samsungmonitor.com

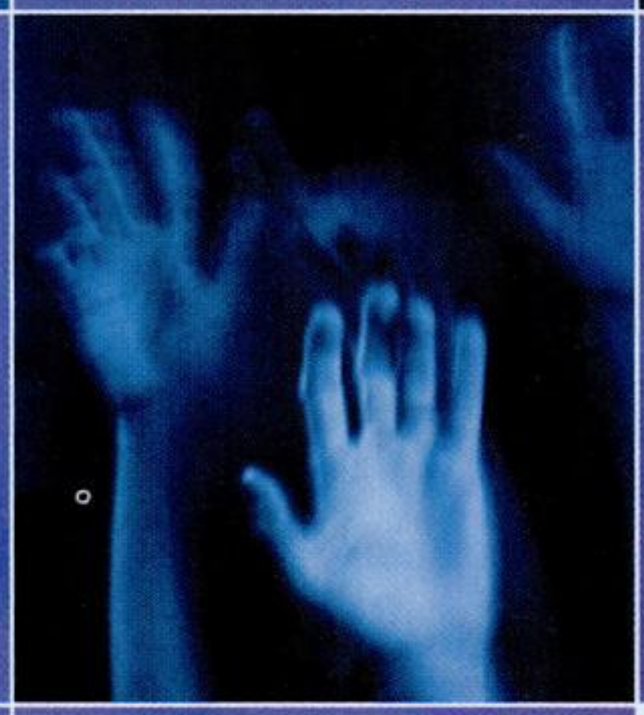
© 2000 Samsung Electronics America, Inc. © 2000 Warner Bros. All rights reserved

SAMSUNG DIGITall
everyone's invited™

Copyrighted material

www.riohome.com

DIGITAL AUDIO



YOUR MUSIC YOUR CHOICE

Hit the road with the latest evolution in portable digital audio players from the rebel leader of the music revolution. Whether your passion is alternative, hip-hop or the fringes of spoken word, Rio delivers a listening experience way beyond mainstream electronics.

Rio

DIGITAL AUDIO PLAYER

Rio is a registered trademark of RioPort.com, Inc. licensed by Diamond Multimedia Systems, Inc., a division of S3 Incorporated.

S3

Copyrighted material

Illustration never looked so good.

Eye-catching illustration, isn't it? And yes, despite the glistening highlights, the realistic textures, the subtle shading, and the soft air-brushed effects, this is a completely vector illustration. And it's only possible with Canvas 7.

Match pinpoint precision with painterly strokes through Canvas 7's exclusive Sprite technology. Blur vector lines, paint transparency effects, apply image filter plug-ins to vectors, text and images. It's hard to believe that you can draw like this – never mind in one, attractively priced program. When you're done, prepare your creative visions for print or web with an incredible array of over 40 file format filters.*

Feast your eyes on Canvas 7 today, and get a whole new outlook on illustration software.

Now available in Professional and Standard Editions.

Get Canvas 7 today!

Professional Edition $375
Competitive Upgrade $199.95
Standard Edition $99.95

www.deneba.com/pc
800.7DENEBA

DENEBA

CANVAS™ 7

No comparison.

DENEBA

WINLIST Windows Magazine 1999 · Macworld · PCWEEK BEST OF COMDEX FINALIST · finalist macworld eddys · NET Internet.Works ESSENTIAL · 99 mac today editors' choice · Desktop Publishers · eMediaweekly · 4-STAR PCComputing March 1999 · BEST Digit BUY · MAC ADDICT FREAKIN' AWESOME! · MacUser · 5 MyMac Magazine

© 2000 Deneba Software. This ad was created using nothing but Deneba Canvas 7. Canvas, SpriteEffects and SpriteLayers are trademarks of Deneba Systems, Inc. For more information send email to sales@deneba.com.

* 40 file formats available in Canvas 7 Professional Edition only.

Copyrighted material

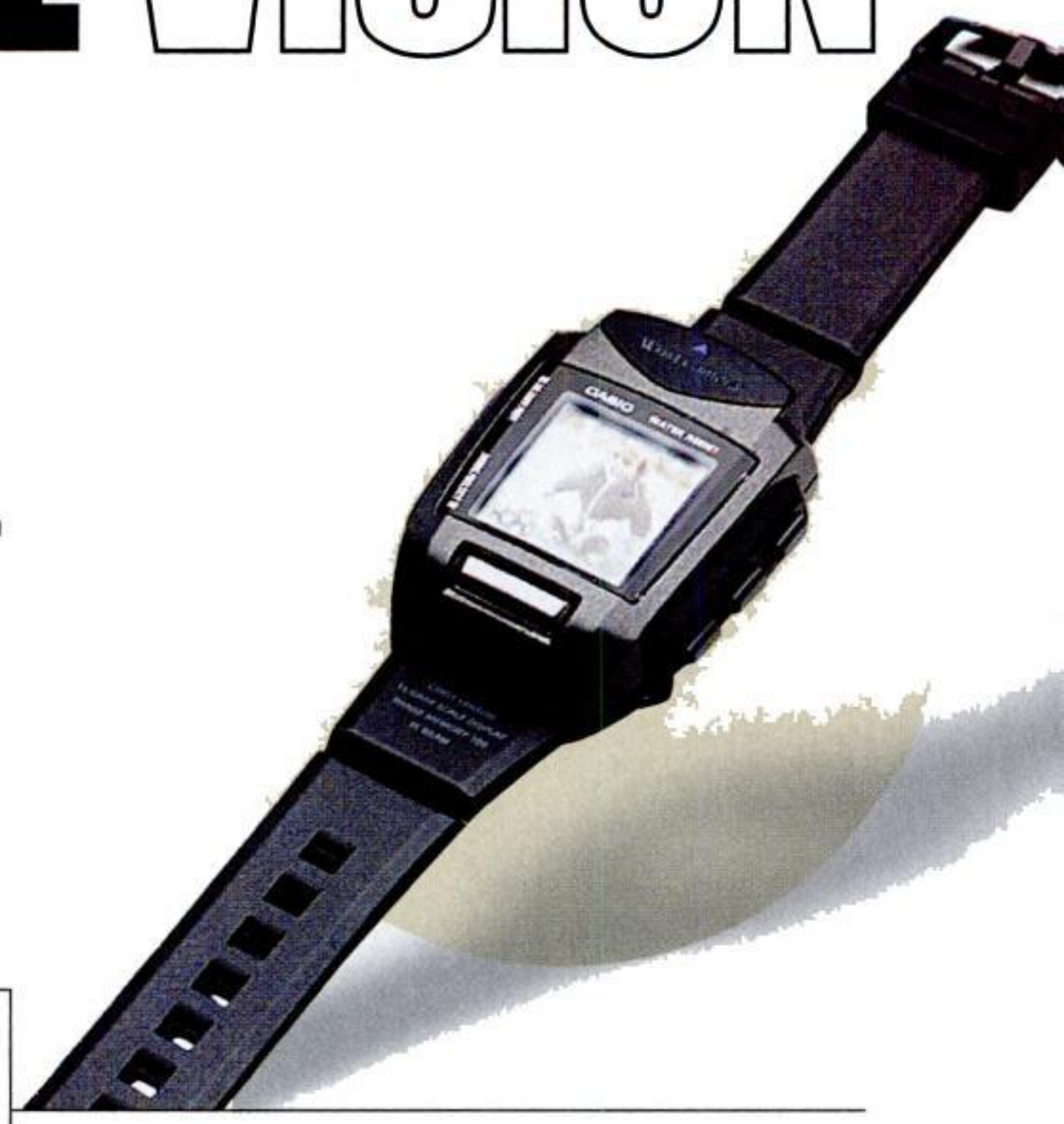
PERIPHERAL VISION

Casio WQV-1 Wrist Camera

If you can't seem to watch "Get Smart" without longing for your own covert mission, we've got just the thing for you. Casio's wrist camera (**www.casio.com**) takes pictures on the sly and still keeps impeccable time. Using a 1/14-inch monochrome CMOS sensor capable of reproducing 16 shades of gray, a 120x120-dot LCD screen that can act as a viewfinder, and a full megabyte of memory for storing up to 100 images, the Casio WQV-1 is primed for any surreptitious photo moment you can dream of. A menu lets you scroll through images, add a time or date stamp to your snapshots, and delete those pics you don't want. Pictures are converted to either BMP or JPEG modes when transferred to your PC via infrared, and three different effects modes let you produce images that are grayscale, two-toned, or a merging of more than one picture. And the Wrist Camera will accessorize nicely with your shoe phone (sold separately).

$200 | Casio

Buy www.SeeMeBuyMe.com | 877.751.7467 ID#1003



Minds@Work Digital Wallet

Imagine you're in the French Riviera and you're snapping digital pics with abandon when your Flash card fills up. Must you forsake your *bain de soleil* tan to scurry back to your hotel and fire up your laptop? *Mais non*, if you have the Minds@Work Digital Wallet (**www.mindsatwork.net**). Sporting a Motorola ColdFire microprocessor, 6GB of storage capacity in a 2.5-inch Toshiba hard drive, and its own simple operating system, the Digital Wallet acts as a completely portable storage device. Accepting media such as CompactFlash, SmartMedia, and Sony Memory Sticks, the Digital Wallet allows you to dump in pics, digital movies, and MP3s, freeing up your memory cards in no time flat. When you're back among your pasty friends and ready to transfer files to your PC, simply jack in with a USB or a PCMCIA connection and sit back and enjoy a speedy 8 to 12MB/sec transfer rate. Weighing in at just 12 ounces and sporting rechargeable batteries that last over three hours, the Digital Wallet is the perfect traveling companion.

$500 ($50 for SmartMedia adapter/$10 for PCMICIA adapter) | Minds@Work

Buy www.SeeMeBuyMe.com | 877.751.7467 | ID#1002

Sony MDR-NC5 Noise Canceling Headphones

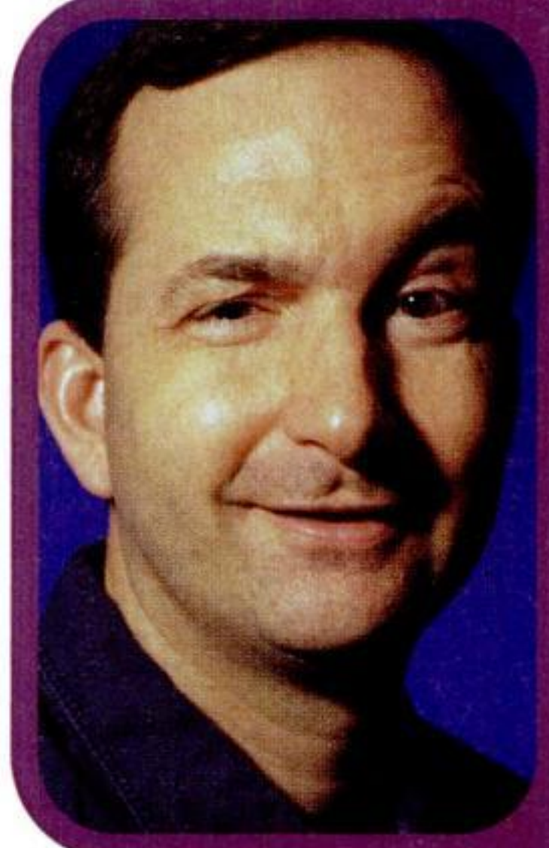
There's nothing worse than sitting on an airplane next to, say, a chatty magazine editor who wants to drone on about his new wrist camera. But when you put on your headphones, you've got to contend with that damned airplane hiss. That's why you need Sony's MDR-NC5 Noise Canceling Headphones (**www.sel.sony.com**). Sony promises a noise reduction of up to 70 percent with these light and comfortable headphones, which include pivoting ear pads for easy folding and storage. The noise canceling circuit, which runs on a single AAA battery, uses a microphone to pick up interference coming from outside of the headphones and then emits a signal to cancel out the bothersome sounds with a strength of up to 10dB at 300Hz. The result is a softer backdrop for your music, so you don't have to turn up the volume to quiet the outside world. But if you're the type for whom volume is a *want* rather than a *need*, these babies can kick out the tunes, thanks to a 30mm diameter driver and a Neodymium magnet for rich bass and really loud-ass output.

$100 | Sony

Buy www.SeeMeBuyMe.com | 877.751.7467 | ID#1001

Copyrighted material

FAST FORWARD



TOM HALFHILL
was senior editor at *Byte* magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com.**

Build It or Buy It?

THE PROS AND CONS OF HOME-MADE PCS

Factory-standard option packages make it almost impossible to buy exactly the new car you want. If you need air conditioning, they'll stick you with power ashtrays and a dual moonroof. If you want a larger engine, you can't get it without the pinstriped door handles and Fokker Triplane spoiler. Fortunately, you can still buy exactly the PC you want—if you're willing to forsake the factory-standard models for a custom-built box.

But it's not a decision to be made lightly. There are many tradeoffs to consider, and sometimes a factory-standard PC makes more sense. Let's take a look at the pros and cons of buying a ready-made PC versus building a system to your exact specifications.

Ready-made PCs have a lot going for them, including low prices. Big companies such as Compaq, Dell, Gateway, Hewlett-Packard, and IBM swing mucho weight in the marketplace and get the latest components from suppliers at high-volume prices. It's hard for an individual who's shopping for components at retail prices to match the low costs of major PC vendors. And name-brand PCs often come with bundled software and rebates.

To some degree, custom builders can compensate by not paying for features they don't need. For example, it's almost impossible to buy a ready-made PC without an internal modem. If you already have a modem—whether it's an analog, DSL, or cable modem—you don't need another one. Why pay for it?

But the biggest reason a custom PC will probably cost more than a ready-made PC is that custom builders are generally the type who demand ultra performance. Otherwise, they'd be satisfied with an off-the-shelf special at the superstore. Custom builders tend to buy the swiftest CPUs, the most versatile motherboards, the fastest graphics cards, the beefiest power supplies, the most floor-throbbing sound systems, and at least twice as much memory as the prevailing standard. To figure out what to buy, these thrillseekers have to do their homework. Otherwise, they risk bottlenecking their mean machine with a lame-o component that can't keep up with the rest of the system.

For others, however, good enough is good enough, and they don't care to spend time learning the intricacies of polygon fill rates, bus frequencies, seek times, and dot pitches. There's nothing wrong with that. Different people have different priorities. Ready-made PCs are easier to buy because all the tricky decisions are made at the factory. If you're not a gamer—as I'm not—then ultimate performance may not be vital. The slowest graphics card in the world is plenty fast for scrolling screens in *Word*, *Excel*, and *Navigator*.

Ready-made PCs are easier to buy because all the tricky decisions are made at the factory.

One advantage of ready-made PCs that's becoming more critical is cooling. Today's wicked-fast CPUs, intensive 3D graphics cards, 7,200rpm hard disks, and dense memory chips radiate much more heat than older components, so strong cooling is mandatory. PC vendors have mechanical engineers who analyze airflow and strategically position the fans, vents, and heatsinks for maximum efficiency. Custom PCs in generic cases are more vulnerable to meltdowns.

The greatest advantage of ready-made PCs is tech support—theoretically. If something doesn't work, you know whom to blame. The quality of online tech support varies widely, but it's better than nothing. My sister bought a name-brand PC primarily because she lives in the boondocks, doesn't know much about computers, and wanted to have a hotline to call (although she usually calls me first).

Sometimes a custom PC is the only way to get a much-desired feature. That's why my home system is a custom job. I prefer a desktop-style case over the ubiquitous tower because it doubles as a monitor stand and conserves desktop real estate. Towers either waste desk space or sit on the floor, where they get bumped and kicked and force you to crawl on hands and knees to swap disks. Almost all ready-made PCs are towers, so I went the custom route. Granted, towers usually have more expansion bays.

You don't have to build a custom PC yourself. I found a shop in Silicon Valley that has a wide selection of components and builds systems for less than $50 in labor. Some custom shops offer mail-order service. Even Dell and Gateway let you make a few substitutions, although they have limited menus.

Finally, don't overlook the smaller PC vendors that cater to speed phreaks. Companies such as Alienware build ready-made systems that rival the best custom rigs. If you shop around, you can get your very own dream machine without ever touching a screwdriver. ✹

Random Thoughts

▶ Recently I wrote that Coppermine-based Celerons are really Coppermine Pentium III processors with half the on-chip L2 cache disabled (128K instead of 256K). A reader asked if that affects the set-associativity of the cache. Yes, it does. A Pentium III's eight-way set-associative cache becomes a four-way cache in a Celeron because half of the cache tags are disabled, making Celeron's L2 cache slightly less efficient than Pentium III's.

▶ Note an important difference between desktop and mobile Celeron processors: The former has a 66MHz system bus while the latter's is 100MHz. There's no technical reason for this. The differences between Coppermine Celeron and Pentium III processors are due to marketing decisions made by Intel.

Copyrighted material

Last night, she shot you down.
TODAY, IT'S YOUR TURN.

Dogfight opponents online in cutthroat multiplay.

Fly 11 tricked-out planes in 24 thrilling missions.

The 1930s ain't what they used to be. America lies in pieces and air power is king. It's a shoot-or-get-shot-down world. You'll dogfight ruthless air pirates. Rescue saucy pinups. Dodge flak from dicey femmes fatales. And mix it up with other aces online. But remember, one thing still holds true—don't get mad, get even.
www.microsoft.com/games/crimsonskies

Big guns. Fast planes. Gorgeous dames.
CRIMSON SKIES™

Microsoft Zone.com ZIPPER INTERACTIVE

TEEN T Animated Violence Use of Alcohol

© 2000 Microsoft Corporation. All rights reserved. Microsoft and Crimson Skies are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Copyrighted material

▶THE SCOOP FROM A MAJOR PLAYER

GAME THEORY

Grass-Roots Gaming

HOW INDIE DEVELOPERS KEEP PC GAMING EXCITING

Markets, as any good capitalist knows, are beasts of supply and demand. Demand for a particular type of computer game may drop to the point where making big-budget titles is no longer profitable, thus causing producers to cut supply. But the demand doesn't completely disappear. It's there, like oil in the ground, waiting to be tapped. Did PC game fans simply cease to be PC game fans because Activision pulled out of the market? Did hardcore flight sim fans stop wanting flight sims because Jane's couldn't earn out its massive budgets? Did wargamers suddenly develop a burning desire to play *Diablo II* because SSI stopped making real wargames?

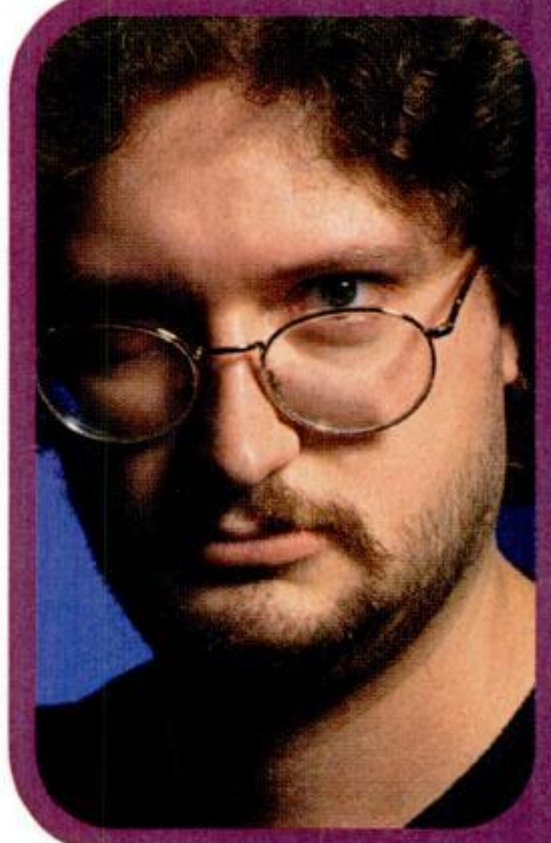
Of course not. And the market responds accordingly, as it always does, from the bottom up—from the grass roots. Even now, indie developers are filling niches abandoned by the major game makers. Market pressures at the opposite end, in the expanding portion of the market, also serve to help the "little guy." The current, if not the only, area of growth is in online gaming, and here, too, the indies are stepping up to fill the demands of a growing niche. So, today's lesson in "Why Capitalism Is Good" is clear: When markets are abandoned by major producers, smaller producers fill the gaps. And when markets are expanded by major producers, new opportunity is created for the independents.

Two companies provide excellent examples of both ends of this spectrum. At the boom end of the spectrum, in the realm of online RPGs, stands World Fusion and its multiplayer online RPG *Atriarch*. At the bust end of the spectrum, we have Big Time Software and Battlefront.com and their hit wargame *Combat Mission*. Both examples show us why the little guy shall always be the hero of PC gaming.

World Fusion can't be called a basement developer, but it's come to gaming in a most unusual manner. After 12 years of creating business apps for major corporations, President Serafina Penchan got a gaming itch that had to be scratched. In their spare time, some of her staff developed the code for *Atriarch*, creating bits of netcode first, testing it, adding a little more, testing again, and so on. It's a process that would never have worked at a major development house, where the need to land a large budget and pre-sell the product usually means that the eye-candy is created first and the hard stuff—the integrated netcode—gets added later.

The growth of both internet commerce and internet gaming opens the door to reaching fans directly.

According to Penchan, "We will have the most stable and well-balanced game possible with the least amount of complexity and greatest amount of features. We can host a single world or multiple worlds the size of the Earth's solar system, and never once need to a hit a zone or any artificial boundary. We can host a world with as many gamers as will physically fit on the planet." The game is *Atriarch*, a massively multiplayer, continuous-world RPG with a science-fantasy setting. *Atriarch* marks a sharp break from the traditional RPG models by emphasizing construction and allowing users to create characters which need not ever fight, if they so choose. The oddly stylized world, unconventional gameplay, and highly-tested, bulletproof internet code are all elements that are more likely to thrive among independents than in the game mills of the big publishers.



T. LIAM MCDONALD is a veteran gamer and game writer. His reviews appear regularly in *PC Gamer* and other publications. Write him at **tmcdonald@maximumpc.com.**

While World Fusion saw a growing niche and followed its instinct to compete and carve out a unique space, Battlefront.com was motivated by a different call. Wargaming was once the lifeblood of PC gaming, earning ample attention in the major magazines and driving early pioneers like SSI for over a decade. As the market evolved, the wargamers remained dedicated, but the publishers (with the exception of Talonsoft) abandoned them. Battlefront.com, an offshoot of Big Time Software, knew that a number of middle-aged white guys (like myself) were still out there hungering for new wargames, so it began marketing directly to the faithful, first with *TacOps* and then with its own title, *Combat Mission*.

Combat Mission, developed by Big Time Software (*Flight Commander*, *Achtung Spitfire!*, and other wargames), was left without a publisher when Avalon Hill went under, so the company decided to go it alone. The growth of both internet commerce and internet gaming opens the door to reaching fans directly. By creating an online buzz, Big Time got to the people who wanted its kind of game, bypassing the entire mechanism of publisher to box to retail to royalties to discount bin.

Big Time never dreamed that *Combat Mission* would splash the way that it did. Released this past summer, the game sold in a month a print run that was expected to last a year. Graphically slick and easy to understand, yet deep enough to satisfy the hardcore crowd, *Combat Mission* has all the makings of a success. The game generated the most positive reviews of any wargame in recent memory, regularly earning top scores in mainstream review venues. Since Big Time is not tied to an outmoded retail model that gives products limited face time on the shelves, the game can earn an audience slowly, and the company can keep the profits for itself.

The lesson? Whether PC gaming grows or shrinks, opportunities will arise for basement developers. Because of the prominence of the internet, we will see more fringe game markets tapped by the independents. Flight sims, wargames, and other genres being ignored by the majors will find a new home in a corner of the net and everyone will benefit. ✹

Copyrighted material

Your Complete Guide to Wireless

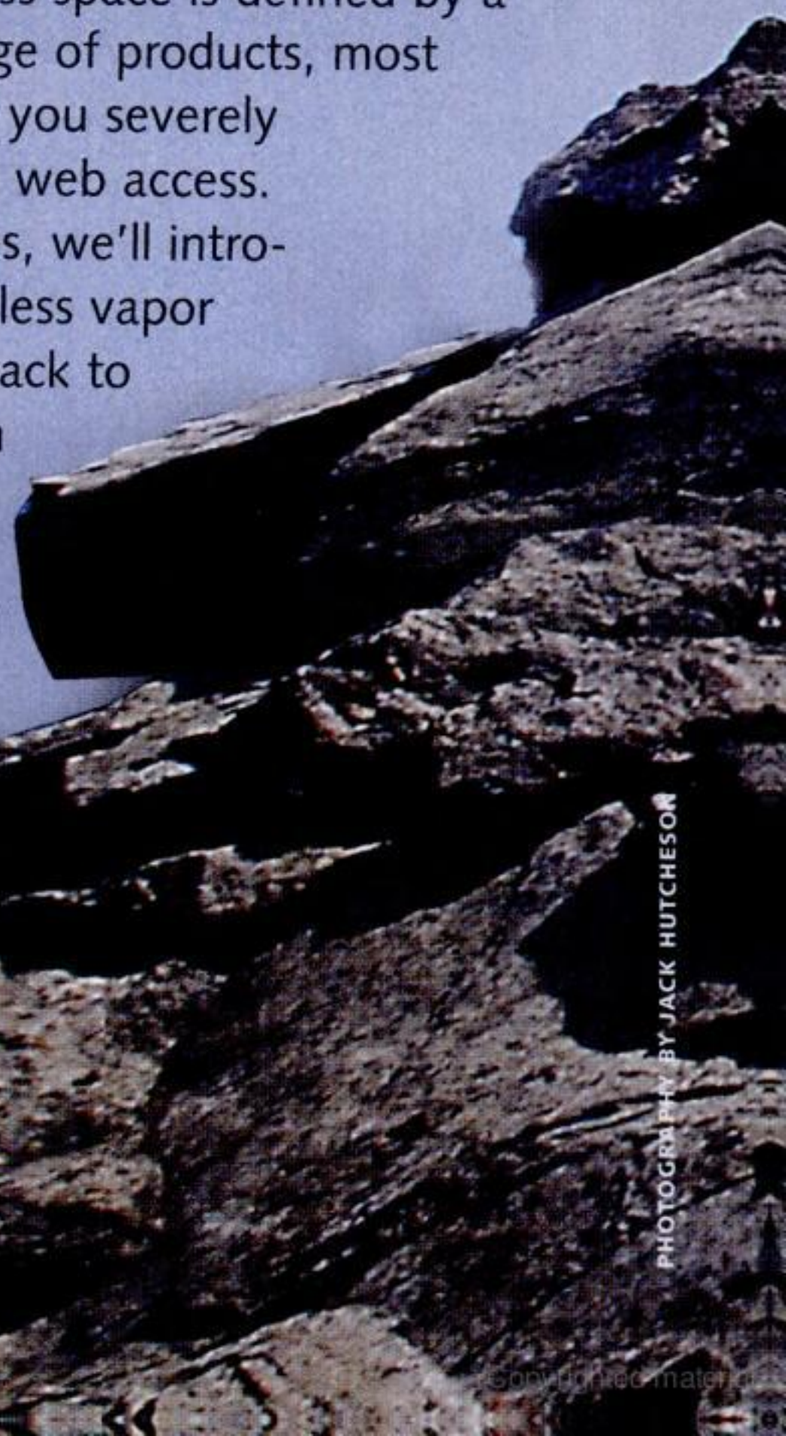
What's real? What's vapor? What works? What doesn't?

We reveal the truth behind the year's most over-hyped computer trend.

Wireless, wireless, wireless. If the media blitz continues, we'll soon see ads for wireless toothpaste, wireless toilet bowl cleaner, and wireless psychic friends. Want to make something better? Make it wireless! Make *everything* wireless.

Wireless, good. Wired, bad. Or so it would seem if you've listened to the radio or watched TV during the last three months. The truth is that when a company announces that it's developed the Next Big Wireless Thing, that technology might not actually reach fruition for years to come. By the same token, when an advertiser hypes a new wireless product that can actually be purchased today, that product may not reinvent your lifestyle or even work acceptably at all.

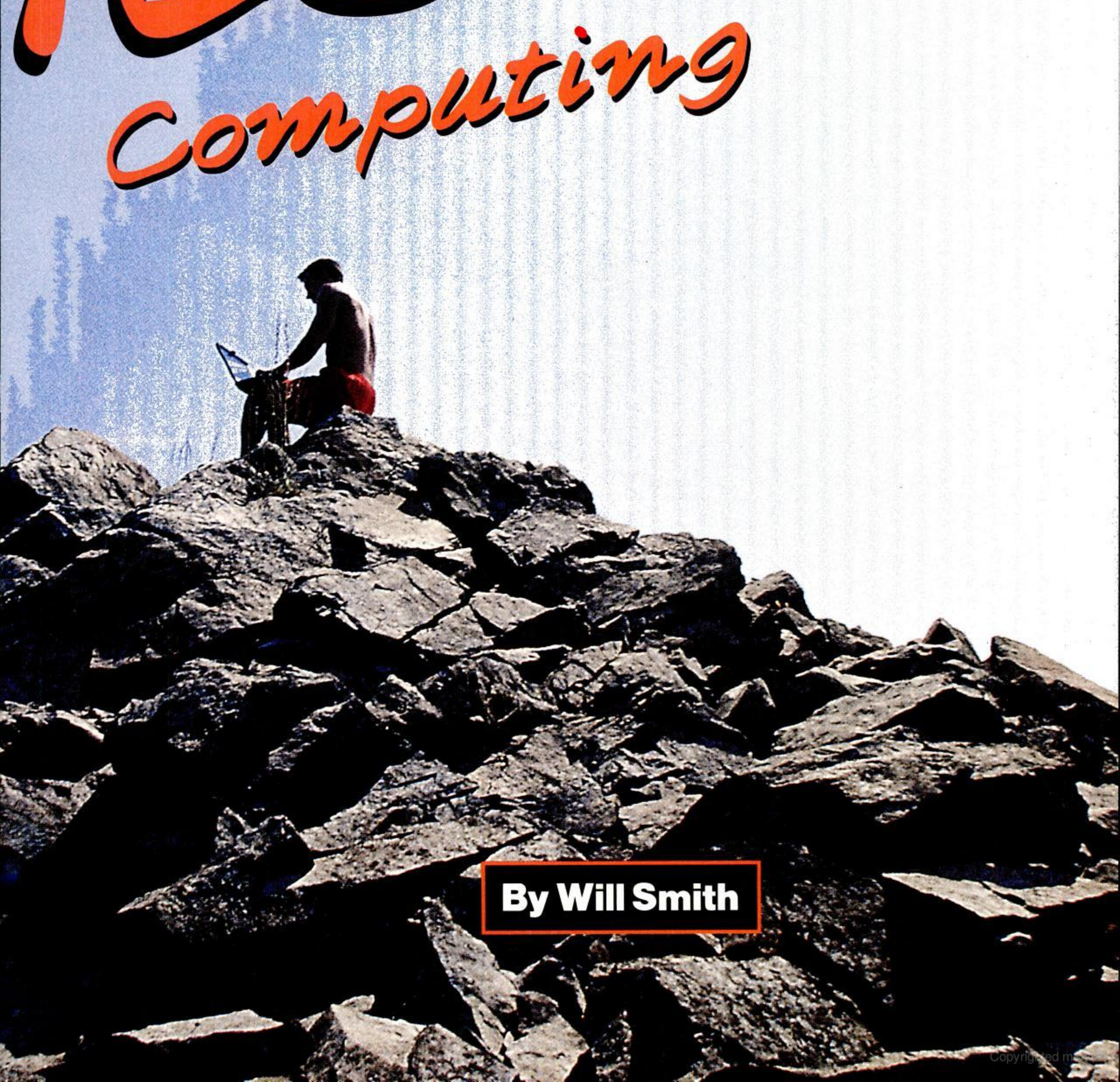
Make no mistake—the future of wireless computing does indeed look exciting. Three, five, seven years from now, you might find yourself in the middle of nowhere, yet fully connected to every type of data service imaginable—robust e-mail, web access, video on demand, and more. But right now, the wireless space is defined by a relatively limited range of products, most of which simply give you severely truncated e-mail and web access. In the next few pages, we'll introduce you to the wireless vapor and then steer you back to reality with hands-on reviews of what's actually shipping.



PHOTOGRAPHY BY JACK HUTCHESON

Copyrighted material

less computing



By Will Smith

Copyrighted m

Wireless

The Rosy Future

Let's begin our foray into wireless computing with a look at the rosiest future scenario. By outfitting himself with four or five essential pieces of gear, the ultimate Wireless Dude living in 2005 will be able to download info from the net, catch a movie, or dump his entire stock portfolio—all while sitting in an inner tube, drifting aimlessly off the coast of Pulau Tiga. The story of Wireless Dude is a story of still-condensing vapor, so bear with us as we entertain what *might* come to pass.

Wireless Dude's most vital piece of equipment will be his portable PC. But this won't be anything like your grandpappy's PC; instead of having a cumbersome keyboard and screen, it will use a voice-recognition interface for input, and a head-mounted display (HMD) for output. This portable computer—or PDA, if a notebook-sized PC proves too unwieldy—will serve as the hub for Wireless Dude's Personal Area Network (PAN). The hub will send processor-intensive data, such as DVD-quality video, to Wireless Dude's HMD and direct traffic among Wireless Dude's constellation of information-gathering tools. Don't expect to see any cables tripping up Wireless Dude, as the PAN will be a purely wire-free system, running at an ultra-high bandwidth across a short-range frequency.

Sound enticing? Let's spend a day in Wireless Dude's shoes to see exactly what we might be getting into.

7:00 A.M.: Grab PDA and all-purpose GPS/Exercise Monitor wristwatch for morning jog. While running, enjoy funky-fresh tunes downloaded from a personalized online music database and order the electronic edition of *Maximum PC* from an online bookseller. Pay for purchases by verbally approving the electronic transfer of funds from bank to retailers. Stop in park to read magazine through HMD.

7:45 A.M.: Return home and log onto PC to check running distance and all the biometric stats your wristwatch was recording. Did you reach your target heart rate?

8:10 A.M.: Jump in car and leave home. Your portable PC queries your wristwatch and compares your current path to your past driving patterns. After determining that you're on your way to work, the portable directs you around any traffic congestion, accidents, or weather calamities that may cause delays.

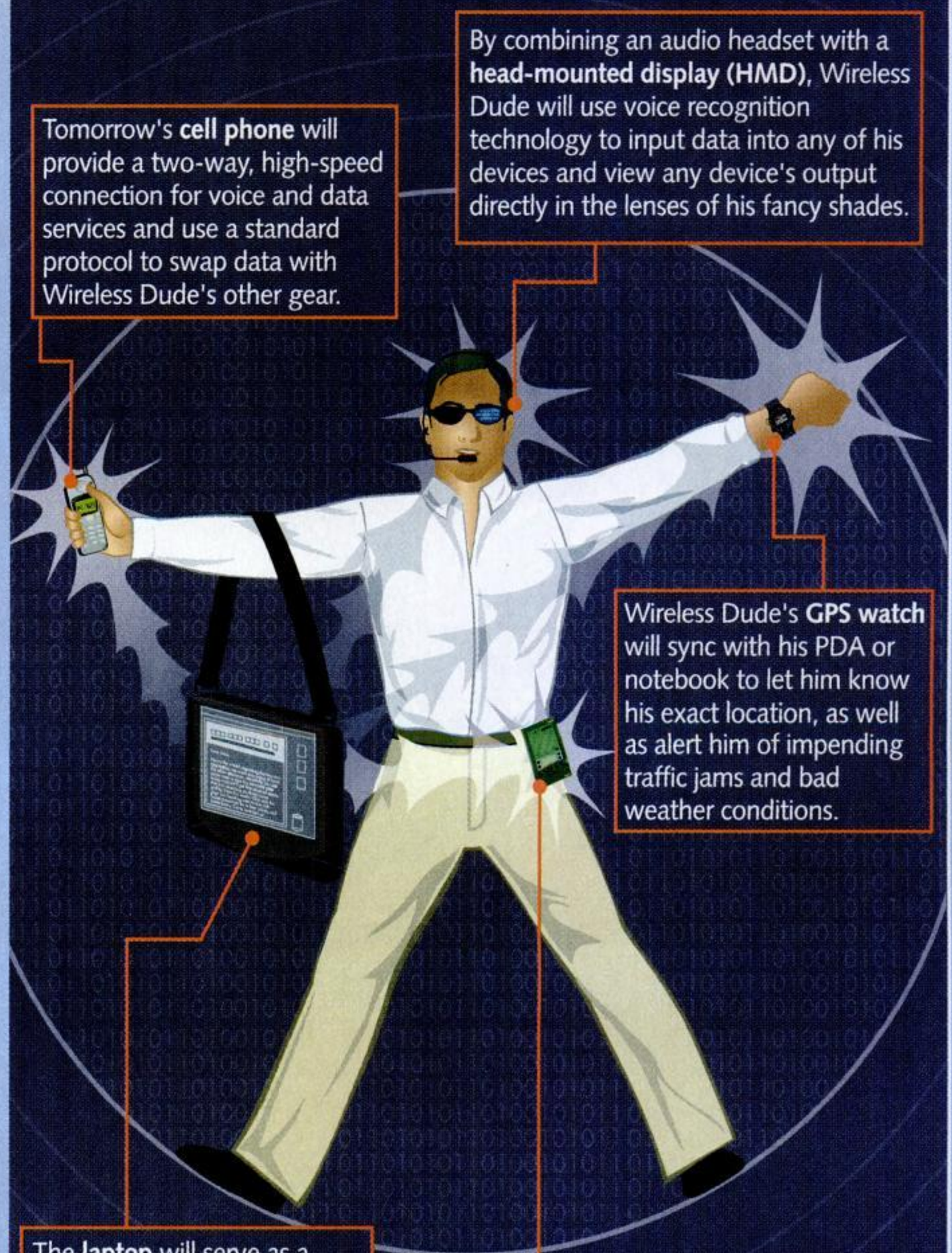
8:20 A.M.: You realize you left the coffee pot on. Log onto your home LAN to turn it off remotely.

8:30 A.M. to 5:30 P.M.: Work. How

Introducing...

Wireless Dude

If today's wireless vapor solidifies according to plan, gadget freaks of the future will be walking information kiosks. Just check out Wireless Dude. His five wireless devices communicate with each other as well as the outside world, and provide Wireless Dude with vital information when he needs it the most.


By combining an audio headset with a **head-mounted display (HMD)**, Wireless Dude will use voice recognition technology to input data into any of his devices and view any device's output directly in the lenses of his fancy shades.
Tomorrow's **cell phone** will provide a two-way, high-speed connection for voice and data services and use a standard protocol to swap data with Wireless Dude's other gear.
Wireless Dude's **GPS watch** will sync with his PDA or notebook to let him know his exact location, as well as alert him of impending traffic jams and bad weather conditions.
The **laptop** will serve as a central hub and traffic cop, distributing information to the appropriate gear and pushing everything from web pages to downloadable movies to Wireless Dude's HMD.
The **PDA** will serve as an all-points back-up when Wireless Dude needs to ditch his heavier laptop. Either device will feed Wireless Dude with a steady stream of email, sports scores, and disappointing ebay notifications.

Copyrighted material

do you think you're paying for all this wireless stuff?

5:30 P.M.: Place your weekly grocery order from the car as you dodge yet another traffic snarl. Aren't you glad your GPS can interrupt your digital music feed with up-to-the-minute traffic information?

5:55 P.M.: Pull into your driveway just in time to meet the delivery man with all your groceries.

6:20 P.M.: Walk over to the multiplex showing *Star Wars: Episode III*, purchasing your tickets in transit and ignoring the glare of strangers as you blithely talk into your HMD.

6:30 P.M.: Bypass the ticket line and cruise directly to a primo seat in the theater.

9:00 P.M.: Head home, rinse and repeat.

Now settle back down into your easy chair, because none of this stuff exists yet. Bluetooth technology, which we described in last month's Inside Sources, merely *hints* at the scenario we just described. But, like everything else described above, Bluetooth doesn't even exist yet! So how *will* it all work? Well, by marrying a common wireless interface for all your electronic gear to smart software that can learn your habits, different devices can compare notes to deliver timely and relevant information to you.

So why aren't we already living in a wireless paradise? There are two main problems: the lack of a wireless infrastructure, and the woefully inadequate state of battery technology. (Don't even get us started on the low-battery-life conspiracy—everyone knows that longer-lasting batteries are a technical slam dunk but would end the retail battery business once and for all.)

Reality Check: What's Shipping Now?

Once there's a unified communications interface for PCs and consumer electronics, a whole slate of wireless possibilities will become available. But let's face it, a revolutionary leap forward in technology isn't going to happen overnight—heck, it isn't necessarily even going to happen. So, while other magazines continue to blow sunshine up your butt, gushing like schoolgirls over our wonderful wireless future, we're going to tell you what's shipping here and now.

By our accounts, the gear can be grouped into five distinct categories: net-enabled cellular phones; net-enabled PDAs; mobile e-mail pagers; wireless home networking kits; and wireless Internet access. Some of these devices will change your lifestyle, others will leave you tearing out your hair. Unless otherwise noted, anything you read about in the next few pages is a real product that we've actually used with our grubby little hands.

Cell Phones: Net-enabled cell phones now let you do everything from checking the latest college football recruiting news to applying for a home loan. In fact, you know the cell phone market is a hotbed of activity when Microsoft vies for a piece of the action. Its upcoming Stinger technology, which should be available next year, will support a largish color display and be able to exhibit entire web pages (mmm... precious battery-devouring color screen). Such rapid advances in technology, combined with dizzying growth in subscriber numbers, has created a market ripe for exploitation.

No one is better at tossing around tech jargon than a cell phone salesman. If you try to buy a phone today, you'll be bombarded with an astounding number of acronyms, such as WAP, CDMA, PCS, GSM, TDMA, and whatever else the propeller heads can think up (see sidebar). There are loads of different phones available, but there are only two simple rules to follow when choosing one—know your provider and the services it offers, and always—*always*—buy your phone from your service provider. Cellular providers have reserved a special place in tech support hell for people who buy unsupported phones: "Oh, you have Model X? That's unsupported. Let's upgrade you to our fully supported Model Y phone!"

We looked at three hot phones supported by three different providers: the Motorola Timeport (powered by Sprint PCS), the Ericsson R280LX (powered by AT&T), and the Motorola i1000plus (powered by Nextel Wireless). During testing, we were primarily interested in how these phones performed as Internet devices. Can you really "surf the net" on a two-inch LCD screen? How easy is it to type an e-mail message using the traditional cell phone key layout?

Net-ready PDAs: Short of browsing the web on a Ricochet-enabled notebook, PDAs offer the most user-friendly wireless web access. They offer much easier data

Learn to Speak Wireless...

▶ **Bluetooth** A set of communication protocols that use the 2.4GHz frequency band to swap data among different types of wireless gadgets.

▶ **CDMA** Code Division Multiple Access is a modulation technique used by digital cell phones. CDMA phones boast superior sound quality and battery life, and CDMA networks support much more call traffic than other types of networks.

▶ **CDPD** Cellular Digital Packet Data is a spec for sending Internet traffic over existing cellular networks. The service is relatively slow and expensive.

▶ **Exchange Server** A corporate e-mail server from Microsoft. Users typically access Exchange Servers with Microsoft *Outlook*.

▶ **GSM** The Global System for Mobile Communications was originally a European standard for digital cell phones. The technology is now used worldwide but coverage is limited in the U.S.

▶ **PCS** Personal Communications Services is a group of cellular services that includes voice, data, and paging, using either CDMA or GSM phones.

▶ **TDMA** Time Division Multiple Access allows multiple cellular digital users to access a single frequency without interference. Each user is assigned a small window of use within a particular frequency.

▶ **T9 Keyboard** The T9 keyboard uses auto-complete to speed up data entry into cell phones. Instead of pressing one key multiple times to enter data (for example, pressing 7-7-7, 4-4-4, 7 to spell "rip"), you simply press 7-4-7 and the phone computes all possible words.

▶ **WAP** Wireless Application Protocol is a spec that describes how Internet data is rendered on a smart cell phone.

▶ **802.11** The IEEE standard for wireless Ethernet (802.3 is the standard for wired networks); 802.11 allows data transfer at rates up to 11Mbps.

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted Material

'SECTS, BUGS & LOCK 'N LOAD!

STARSHIP TROOPERS™

TERRAN ASCENDANCY

The Terran paradise of Buenos Aires has been annihilated by a guided meteorite! Federal Intelligence has established the source of the meteorite as Klendathu, home world of the Arachnids.! It's time to earn your place in the human race. Command a crew of heavily-armored, totally insecticidal troopers throughout a blistering real-time strategy trial-by-fire. Launch air-strikes, capture prisoners, and nuke bug-holes as you face off against vicious bug battalions - including Tanker Bugs, Hopper bugs, and of course, Brain Bugs. Answer the call! Defend your planet! Destroy all insects!

Swarms Of Giant Arachnids!

State-Of-The-Art Military Technology!

Customize Mission Teams!

For the 3D accelerated only!

RATING PENDING RP CONTENT RATED BY ESRB

bluetongue

HASBRO Interactive

Starship Troopers: TM & © 2000 Columbia Pictures Industries, Inc. All Rights Reserved. © 2000 Hasbro Interactive, Inc. All Rights Reserved.

Copyrighted material

input, and boast larger screen sizes than e-mail pagers and net-enabled cell phones. Currently, two Palm devices define the web-ready PDA space—the Palm VII and the OmniSky Minstrel V wireless modem for Palm V. Both devices have wide coverage areas and allow you to grab relevant information from popular web sites. But both have their problems as well. The Palm VII can only download data from sites that are specifically optimized for the PDA's proprietary service, and the OmniSky is an expensive add-on to an already expensive PDA.

E-mail Pagers: Most mobile e-mail devices are nothing more than prettied-up, two-way pagers. They certainly don't offer the bounty of applications that you'll find on a Palm or Windows CE device, but they do let you send and receive small e-mail messages while you're strolling down the boardwalk. While there isn't a perfect wireless e-mail solution, we found two next-gen products that were worth taking a look at—the Motorola T900 and the RIM Blackberry. Both are capable of sending and receiving e-mail, and the Blackberry has some compelling extras that may be of particular interest to corporate types, such as the ability to sync with Microsoft Exchange Server.

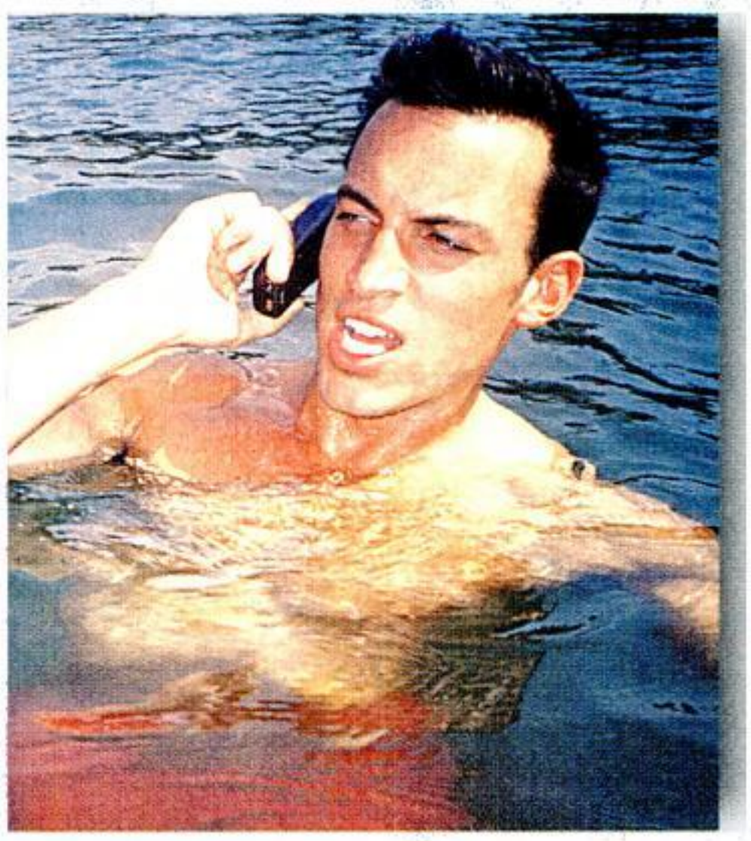
Despite any additional amenities they might offer, e-mail pagers still suffer frustrating interface problems, which you're already well aware of if you've ever used a keyboard with keys the size of a grain of rice. As if that weren't bad enough, two-way pagers are frequently dog-slow when transmitting messages, and e-mail pagers aren't an exception to the rule.

Wireless Home Networking: Before the term "wireless" became synonymous with handheld gadgets, it was most often associated with home networking kits. The first widely marketed kit was the craptacular Diamond HomeFree Wireless, which is thankfully no longer available. This kit used the 2.4GHz frequency band, but its weak transmission signal made for unreliable communication between computers sitting just a few feet away from each other. As with all wireless devices, varying signal strength and interference can play a major role in home networking reliability (or lack thereof). And no one wants to lose a game of *Quake III* just because his connection dropped when someone turned on an electric shaver.

If you want a wireless kit that *doesn't* suck, check out either of the 802.11-based kits that we review here. The provocatively named SOHOware CableFree. NetBlaster and the Lucent ORiNOCO should allow wireless net access/connection sharing throughout your home. The really groovy thing about these home kits is that if your company has an 802.11 wireless LAN (the industry standard), you'll be able to use the same Network Interface Card (NIC) at both home and work.

Wireless Net Access: Ricochet is the 500-pound gorilla of the wireless net access market. Attach a Ricochet modem to your notebook and you can surf fully rendered web pages from speedboats, roller coasters, or mountain tops. In fact, you can enjoy the oh-so-familiar web experience from just about anywhere—as long as you don't wander out of your coverage range.

Because Ricochet's two-way, wireless net service requires the erection of five



radio transceivers across every square mile of the user's access range, Ricochet service is essentially an urban amenity. The shoebox-sized transceivers are mounted on streetlights, utility poles, and tall buildings, which are few and far between in, say, rural Wyoming. At press time, Ricochet was prepping for an expanded nationwide rollout. By the end of the year, the following metropolae should have 128Kbps service: Baltimore, Boston, Chicago, Dallas, Denver, Detroit, Houston, Kansas City, Los Angeles, Miami, Minneapolis, Philadelphia, Phoenix, San Francisco, St. Louis, Salt Lake City, Seattle, New York City, and Washington, D.C.

Currently, Seattle, San Francisco, and Washington, D.C., have 28.8Kbps service, which we reviewed way back in December 1996, giving it an 8 verdict. Sure, downloads were slow, but we could surf the net from almost anywhere in San Francisco with only infrequent service drop-outs. We wanted to test the service again, but Metricom (**www.metricom.com**), the company behind Ricochet, wasn't sending out any new modems until it was ready to provide 128Kpbs service. We'll review this service when Metricom is ready to roll. Expect to pay about $250 for your Ricochet modem and about $45 for all-you-can-eat monthly service.

If you don't live in one of the cities mentioned above, you can always pop a cellular modem into your notebook. The problem with these CDPD devices is that the hardware itself is extremely expensive, you pay even more in ridiculous per-minute service charges, and bandwidth crawls along at 19.2Kbps.

We didn't look at wireless broadband connections for the home, simply because they require fixed antennas, and thus aren't truly mobile. However, if you live in Tucson or Phoenix and want to check out this potentially swank broadband technology, go to **www.sprintbroadband.com**. If you have an unobstructed southern exposure and don't mind hoisting a dish, check out DirecPC satellite access (**www.direcpc.com**), which was reviewed in our November 99 issue. Like the Sprint service, DirecPC is home-bound. In fact, it's not even truly wireless, as upstream communication transpires over traditional modem lines.

Of all the buzzwords associated with today's wireless hyperbole, the one most likely to change your life is Bluetooth. Bluetooth is a suite of specifications that define everything from the radio frequencies at which devices communicate to the I/O protocols shared among different classes of gadgets. Bluetooth technology could potentially enable Wireless Dude's gear to communicate without configuration. But while the Bluetooth spec appears to be well thought out, we've heard about it for two years running, and it's *still* vapor! At press time, Bluetooth products were not yet shipping, although Ericsson is expected to have a Bluetooth-enabled cell phone headset by the time you read this.

We figure it will be at least three or four years before Bluetooth is integrated into a majority of appliances, and, even then, it won't have enough bandwidth to send video to an HMD. While three or four years isn't a long time in the big scheme of universal happenings, it's an eternity in technology time. Remember our Dream Machine 97 creation? It included a Pentium II 300! Now how archaic does *that* seem?

Before you ponder that question for the ages, check the following hands-on reviews of wireless devices that are actually shipping. It's time to bust the hype.

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyri

Wireless

WAP Phones

Three new ways to drive dangerously and annoy others

We began our testing of WAP phones with a heavy dose of skepticism. Internet access via a cell phone? Bah! Who wants to squint at postage stamp-sized screens? And how does one enter a full e-mail message on a telephone key pad?

WAP stands for Wireless Application Protocol, a spec that describes how e-mail and text-based web content is prepared for, sent to, and rendered on handheld devices. After using a trio of WAP-enabled cell phones, we were ready to ditch our cynicism. If you're a full-time cell phone freak, you can add Internet access to your litany of must-have items. Here, we review two WAP phones from Motorola (**www.motorola.com**), and one from Ericsson (**www.ericsson.com**).

While they're certainly not as powerful as a Palm V armed with an OmniSky modem, WAP phones offer surprisingly addictive net access. Need the latest headlines or stock quotes while waiting for the train? A WAP phone can give you little information snippets in a snap. We used WAP to locate our local Subway Sandwich shop, cruise Countrywide.com to check loan rates, and buy books from Amazon.com.

Unfortunately, you won't be able to browse just any web site—WAP phones can only download the scant random pages that use the special Wireless Markup Language. For example, our WAP phones choked when we tried to download Maximumpc.com. Don't be discouraged by the current lack of WML support, however. As more and more WAP phones land in consumers' hands, we expect more and more web domains to host WML content.

There are three competing protocols for wireless phone service: Time Division Multiple Access, Code Division Multiple Access, and the old analog Advanced Mobile Phone System. Both TDMA and CDMA offer longer battery life and (for most people) better sound clarity than analog. Keep in mind that the conditions of your local wireless network will have a greater effect on sound and signal quality than the actual electronics inside your phone. To make an informed buying decision, ask friends what they think about the coverage and service quality of their particular local wireless network.

Now let's look at the phones themselves. First up is Motorola's Timeport 8167, which takes the classic Motorola StarTac design and shoehorns some very big features into a very tiny phone.

The most notable addition is the built-in micro-browser that lets you cruise the web or read AOL mail on the run. Our test unit used the CDMA Sprint PCS network, which runs at 1.9GHz. Using the micro-browser, we were able to pull down weather reports, driving directions, and flight information for the major airlines. A reference section even lets you check dictionary definitions and consult food recipes.

While we're amazed by the breadth of content at our disposal, we were stymied by the phone's small screen. All content appears in three lines of text, displaying 16 characters per line. It's like surfing the web through a microscope! (In comparison, the Motorola T900 e-mail pager offers four lines of text, with 19 characters per line.)

THE SPECS

TIMEPORT

PROTOCOLS
Dual-band 1.9GHz CDMA, 800MHz AMPs phone

STANDBY/TALK TIMES
175 hours/4.2 hours

THE SPECS

i1000PLUS

PROTOCOLS
800MHz iDen

STANDBY/TALK TIMES
50 hours/3 hours

THE SPECS

R280LX

PROTOCOLS
800MHz TDMA, 1.9GHz TDMA, 800MHz AMPs, CDPD

STANDBY/TALK TIMES
160 hours/4 hours

Sleek and silver, the Timeport includes a data cable but suffers from a small screen.

Combining good standby time and a well-designed interface, the Ericsson is our pick.

You can use the Timeport phone to compose e-mail, but data entry is severely hampered by the traditional phone key layout, in which one number represents more than one letter. If you need to type the letter Z, for example, you press the 9 key four times, and then move on to your next letter. The Timeport comes with its own e-mail address (care of Sprint), but you can also route e-mail through an existing AOL account.

Of the three phones we reviewed, the Timeport was the only one to include a data cable that'll work with almost any notebook. The cable synchronizes your phone with your PIM and lets you use the phone for dialup sessions. We were able to achieve fairly constant 14.4Kbps data connections inside the *Maximum PC* offices.

Sprint's digital network is one of the youngest networks around and has been razzed for poor coverage. Nonetheless, we didn't experience any dropped calls at work. The Timeport boasts an ample standby time of 175 hours and 4.2 hours of talk time. Net access is available from Sprint as part of an option package or for $10 a month. Unfortunately, any time spent browsing also dings your "free" minutes, so you *will* pay for the net access

Copyrighted material

in the long run.

Motorola also sells an optional Timeport Clip-On Organizer, which left us underwhelmed. Essentially a Rex organizer that attaches to the phone, the Clip-On adds a lot of bulk, and we didn't appreciate having to use a separate cable to sync the organizer. Of the three phones reviewed, we give the Timeport props for styling, small size, and the inclusion of a data cable, but we dock points for its small screen.

Next up was the Motorola i1000plus, which uses the Nextel service. Was the i1000plus grown on the ugly farm? Compared to the Timeport, the bulky i1000plus looks very 1995. But looks aren't everything. After pounding on the i1000plus' keyboard for a while, we found that it offers a more satisfying net experience than the Timeport does.

Though it uses the same basic GUI as the Timeport, the i1000plus boasts five lines for displaying text. The i1000plus also seems much snappier than the Timeport during browsing. We're not sure if it's because the i1000plus is faster or because Nextel's service is faster.

Nextel's bundle of services is compatible to Sprint's, but instead of AOL mail, you can check MSN mail. Using the i1000plus, we effortlessly purchased a book from Amazon.com while drinking morning coffee in the Imagine Media atrium. Even nicer is Nextel's pricing plan. At press time, it cost about $20 for unlimited net access (a $15 plan lets you browse pre-programmed sites only).

Data entry on the i1000plus is performed with the T9 auto-complete system. As you type in a word, T9 compares your word-in-progress to a built-in dictionary and guesses at the word that you want. The system theoretically cuts down on typing time, but is contingent on the dictionary having your word. And, of course, you still have to cope with the traditional phone key layout.

Nextel's service is geared toward businesses, as the features on the i1000plus make clear. For example, the i1000plus supports Direct Connect, which lets you use the phone as a walkie-talkie. This feature is great if you need to converse with a group of people at once, but it has limited usefulness for civilians. We did like the phone's speakerphone feature, however.

The Achilles' heel of the i1000plus is its sub-par standby time of just 50 hours. With its 900-milliamp lithium ion battery, the phone requires almost nightly feedings at the charger to keep it going. Its talk time is a respectable three hours, but 50 hours of standby time is nearly criminal given the three- to four-day standby times of many other phones.

It may look like a throwback to the mid-90s, but the i1000plus has speed and a generous screen.

Finally, we come to the Ericsson offering. In this roundup, Ericsson's R280LX offers the best blend of phone features and net access in one unit. With a four-line text display, the R280LX offers a larger screen than the Timeport and has a much longer standby time than the i1000plus phone.

The R280LX's most notable feature is its interface, which is far easier to navigate than either of the Motorolas'. The menus are well-organized and don't require you to hunt through tiers of choices to find what you want. At many sites, we were up and browsing with the R280LX within minutes, while it took us 15 minutes just to find where to enter a URL on the other two phones.

The R280LX phone uses CDPD protocol, which hits data rates of 19.2Kbps and is thus relatively snappy. There's only a slight pause as the phone searches a site and returns information. CDPD is supported in more than 3,000 cities and is the same system used in the OmniSky modem for the Palm V. The phone offers a wealth of e-mail options, including direct service support for POP3 mail (you can grab POP3 mail from the other phones, but you have to do so through Yahoo's web-based mail interface, which is WML-ready).

For data entry, the R280LX uses T9 input for dictionary auto-complete. Another nice touch is the enhanced pound key, which quickly lets you enter some of the common punctuation marks, such as periods, question marks, or exclamation points.

The R280LX also features all the amenities that people have come to love in Nokia phones—different ring modes to tailor the phone for an office, theater, or outdoor setting, and a full list of melodies to use as your ring tone. The ringer is loud, though, and Ericsson didn't include a vibrating function, which the two Motorolas had.

One annoying problem with the phone was the need to switch from net mode to voice mode. The phone takes several seconds to switch, and it looks like it's rebooting. The phone's charger is also a bit large for such a small device.

Of the three phones reviewed here, the R280LX felt the most solid. With a long standby time of 160 hours and a talk time of four hours, we think the R280LX offers the best of both worlds—a phone that'll work almost anywhere in the U.S., with a screen large enough for quality web access.

—Gordon Mah Ung

TIMEPORT PLUSES
- Good standby time
- Uses standard headset jack
- Best styling and size
- Dual-mode

MINUSES
- Small browser window
- Slow net access

i1000PLUS PLUSES
- Walkie-talkie functions
- Relatively large screen
- Swift net access
- Sturdy

MINUSES
- Beaten with an ugly stick
- Needs adapter to use headset
- Awful standby time

R280LX PLUSES
- Quad-mode
- Best screen interface
- Great standby and talk times

MINUSES
- No vibrating mode
- Headset support is proprietary

MOTOROLA TIMEPORT 8
$300 with service | Sprint
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1006

MOTOROLA i1000PLUS 8
$130 with service | Nextel
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1007

ERICSSON R280LX 9
$300 with service | Sprint
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1005

Wireless

Wireless Palm PDAs

Web access for worldwide wanderers

Cell phones and pagers might promise wonderful net access, but only wireless Palm devices deliver the goods when you need robust web content en route. The Palm VII (**www.palm.com**) definitely gets the job done but can't compete with the OmniSky Minstrel V (**www.omnisky.com**), a wireless add-on for the Palm V and Vx.

The 19.2Kbps Minstrel modem adds a little heft to your Palm's footprint, but it's more than worth it. Snap the fully charged CDPD modem to the back of your PDA and—BAM! Via TCP/IP, you've got 12 hours of web access at your fingertips. You won't get coverage outside of most major metropolitan areas, but OmniSky says that its service reaches over 60 percent of the country's business community.

Installing the OmniSky software on your Palm automatically equips you with tons of PQAs—miniscule apps that download "clipped" web content that's been formatted for display on the Palm's small screen. You can install other PQAs at will (including any of the 300-plus that reside at Palm.net), but your web connection with OmniSky isn't limited to the PQAs installed on your Palm. Unlike the Palm VII's service, OmniSky provides actual browsing capability. Enter any URL and your request is fielded through OmniSky's server, which stores PQAs for numerous URLs and automatically sends you the clipped content for the URL you've requested. If the site you want to see doesn't have a PQA, or if OmniSky's server hasn't catalogued it, OmniSky's software attempts to transcode the page into something your Palm can read. Especially complicated pages might be rendered as gobbledy-gook, but if you tell OmniSky to search for sites within the realm of its "optimized content," you'll get access to something that's prepared for viewing.

OmniSky's e-mail service puts the Palm VII's service to shame by letting you grab messages from up to six POP3 accounts. Entering text is simply a matter of mastering Graffiti, or calling up the Palm's virtual keyboard and hunting and pecking with your stylus. In either case, it's a helluva lot easier than tapping out messages on a two-way pager or cell phone equipped with a mini-keyboard or dialing keys.

Even the fat price tag—$300 for the modem, plus $40 a month for unlimited web service—hasn't discouraged us from taking our Palm V/Minstrel combo everywhere. On one wire-free night, we used it to round up friends via e-mail, check movie listings and buy tickets, locate the nearest watering hole, and map out the best route to walk from the bar to the theater

Smaller packaging aside, the Palm VII got schooled by the OmniSky modem. Palm VII e-mail access is limited to the account that's set up with the Palm.net wireless service, so unless you're willing to forward your other accounts, you're SOL. Same goes for the Palm VII's web access—it's good, but not good enough. Unless a site's web clipping app is already installed on your PDA, it's hands-off for you. Granted, Palm.net has done a nice job of cataloguing hundreds of popular PQAs, but you're in charge of downloading them when your Palm is docked at your PC.

The Palm VII's service is available in most major metropolitan areas. Its pricing scheme offers some options that OmniSky doesn't, so if you're looking for service on the cheap, you can choose the $9.99 a month plan. Beware, though—that ten-spot will get you just 50KB of information a month, which pans out to about 30 e-mail messages, 20 stock quotes, and 10 weather reports. We recommend you go with the flat-rate plan for $45 a month. The Palm VII itself costs $449—a hefty savings over the $300 modem-plus-$329 Palm V—but if you're looking for a wireless PDA solution that'll feed your jones for connectivity over the long haul, the extra $200 for an OmniSky is worth it. *Note: We gave the Palm VII a 9 verdict in November 1998. The new verdict below reflects the VII's relative value as a wireless net device; general Palm functionality was not taken into account.*

—Kristen Shepos-Salvatore

For real web access on your PDA, OmniSky's got the goods.

THE SPECS
OMNISKY

DIMENSIONS
4.92 L x 3.42 W x.39 D inches; 4.6 oz, 8.5 oz with Palm V attached

NETWORK
AT&T Cellular network

BUNDLE
OmniSky software, power supply

OMNISKY PLUSES
Access isn't limited to PQAs already on the Palm

Can check any POP3 e-mail account

MINUSES
Adds weight to your PDA

Pricey solution when you add the cost of the actual Palm

THE SPECS
PALM VII

SCREEN RES
160x160 grayscale

PROCESSOR
Bell South's Intelligent Wireless Network

NETWORK
I/O: IrDA port, docking port

DIMENSIONS
5.25 L x 3.25 L x .75 D inches; 7 oz

BUNDLE
Docking cradle

PALM VII PLUSES
Since it's part of the Palm itself, the price is nice

Smaller solution than the OmniSky/Palm V setup

MINUSES
No web browsing

Access only to Palm.net e-mail account

The Palm VII's wireless service is OK, at best.

OMNISKY **9**

$300 for modem, $40/month for unlimited service | OmniSky
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1010

PALM VII **6**

$449 for Palm, $45/month for unlimited service | Palm
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1011

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

Wireless E-mail Pagers

Feed your e-mail addiction anytime, anywhere

Everyone loves e-mail. In fact, for some people, checking e-mail becomes such an obsession, life comes to a complete halt when they can't steal away for a quick fix. If you're so afflicted, we present the Motorola Talkabout T900 (**www.motorola.com**) and RIM Blackberry 957 (**www.blackberry.net**). While both handheld devices are capable of sending and receiving e-mail, each device has its own target audience.

The T900 is a versatile pager, but it hasn't yet mastered wireless e-mail. For starters, Motorola doesn't provide software to forward messages from your regular e-mail account to the T900. Of course, an industrious user can set filters to forward messages to the pager's e-mail address, but when you reply to such a message, your return address may not be familiar to your friends and co-workers. This isn't the T900's worst problem, though. Because the device must use a nationwide paging network, the T900 suffers from the same limitations as traditional two-way pagers—specifically, terribly slow transmission. In our tests, it sometimes took as long as 15 minutes to send and receive messages. The good news is that traditional paging networks allow the T900 to send and receive messages in most of North America. None of the other wireless devices we looked at have anything approaching this kind of coverage.

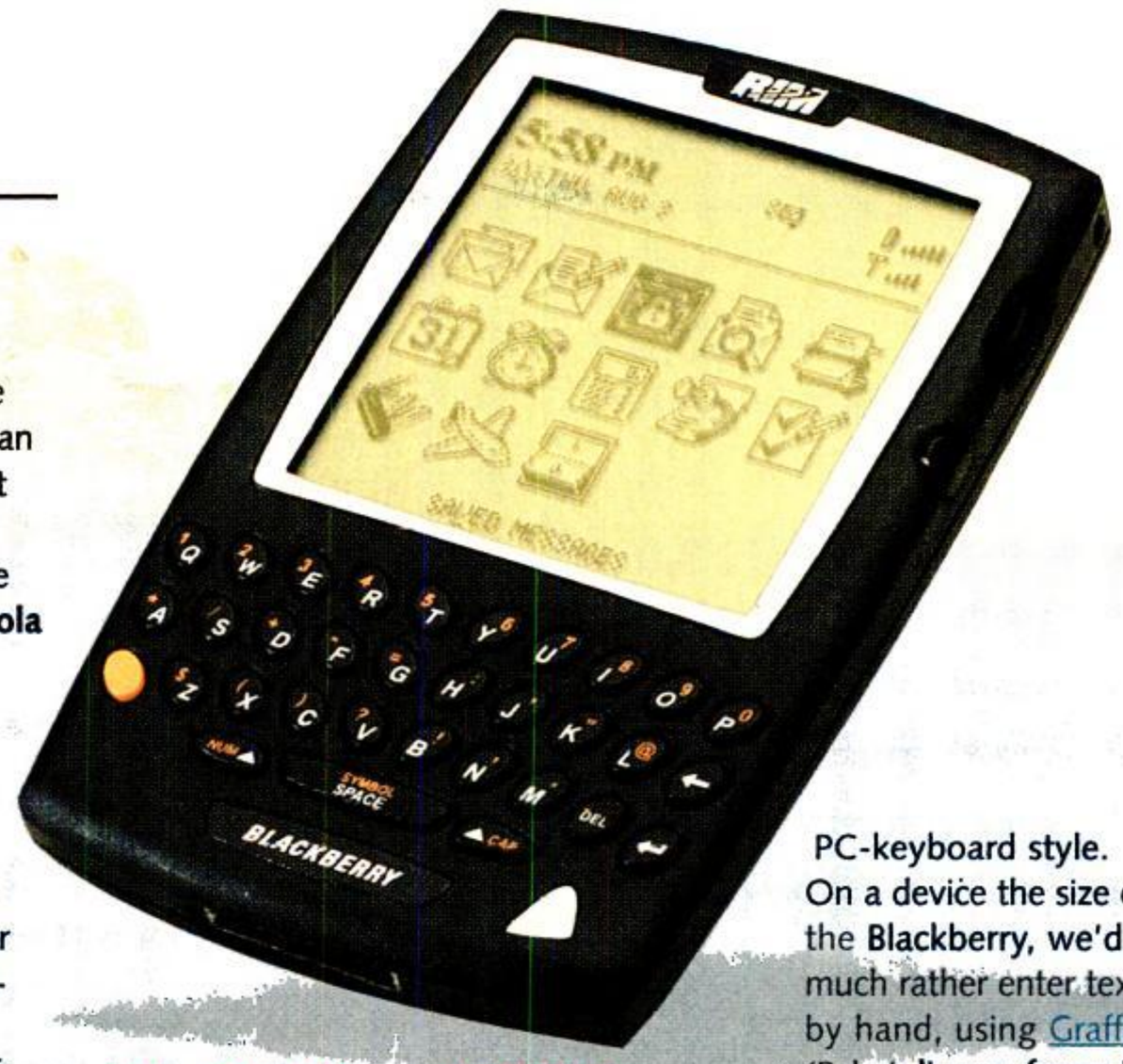
The RIM Blackberry 957 was originally targeted at corporate folk who use Exchange Server for enterprise-wide mobile e-mail. RIM is also planning an ISP version of the Blackberry, which should be available soon from selected nationwide ISPs. While the corporate version *can* be used without Exchange Server if you have an always-on net connection and are willing to set e-mail filters, we suggest you wait for direct ISP support. The Blackberry is a little smaller than a Palm III and provides wireless e-mail functionality via BellSouth's Wireless Data Network (which the Palm VII also uses). Included is *Intellisync* software, which can sync the Blackberry with most major PIMs. Blackberry apps include a contact list, task list, notepad, and calculator. And one of the niftiest things about the Blackberry is that it's capable of keeping track of which messages you've looked at, on both your desktop and your handheld.

Messages sent to and from the Blackberry typically arrived in less than five minutes. Unfortunately, service range is pretty much limited to cities with more than 50,000 people. Check RIM's web site for specifics.

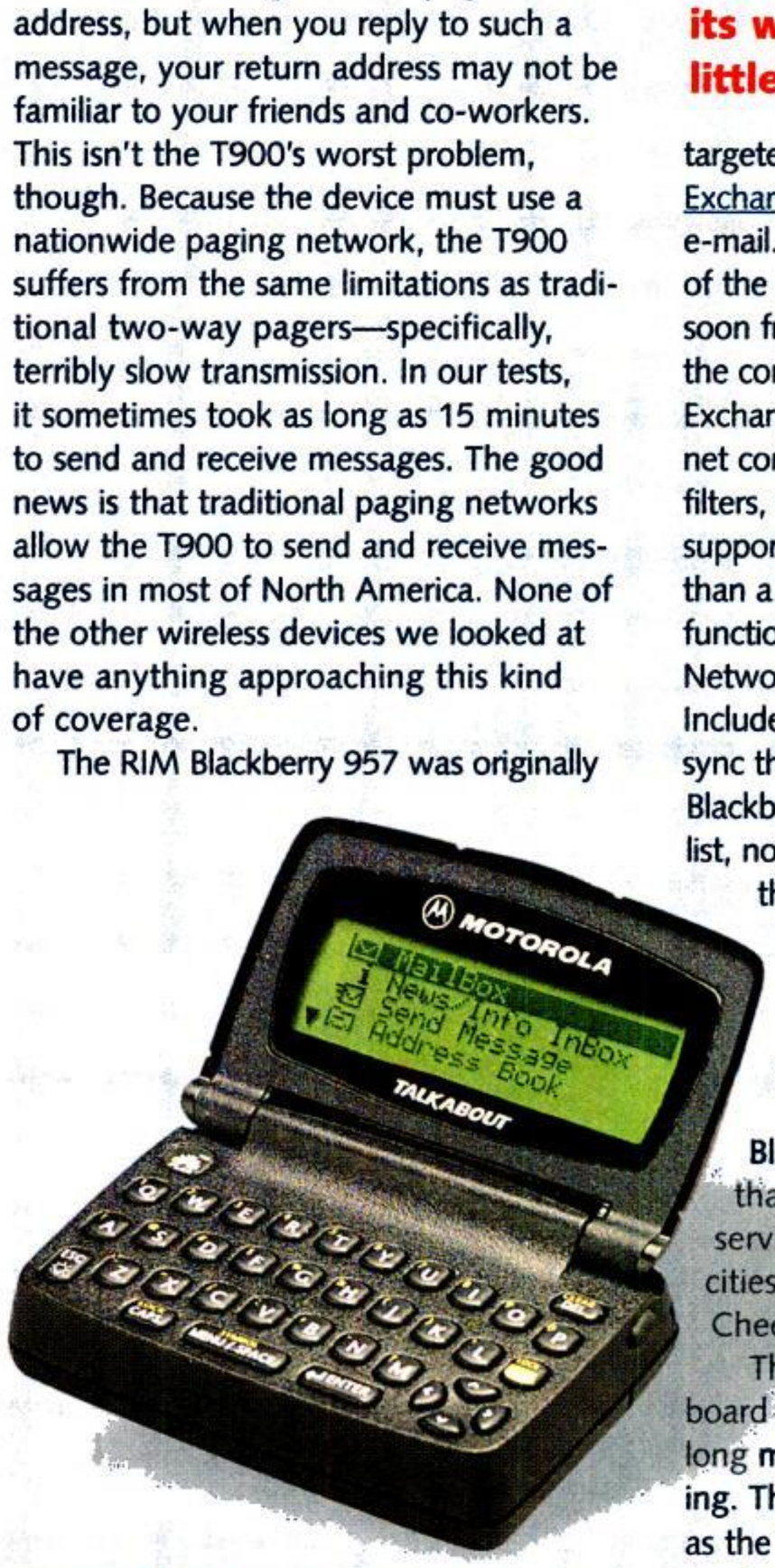
The Blackberry features a tiny keyboard and rolling selection wheel. Writing long messages is trying and time-consuming. The keyboard is about the same size as the T900's, but the T900's keyboard is much more intuitive because its symbol keys are laid out in the standard, 104-key, PC-keyboard style. On a device the size of the Blackberry, we'd much rather enter text by hand, using Graffiti (Palm's lingua franca), than search for an ampersand on the tiny keyboard.

In the relatively new world of wireless e-mail, there's no clear winner. We really dig the Blackberry, but it's not a perfect answer and is considerably more expensive than most PalmOS devices. The T900 is really more of a pager with incidental e-mail functionality than a wireless e-mail device, and we wouldn't recommend it to anyone who wants to make his current e-mail situation portable. If you're an e-mail junkie, you'd be better off with a Palm V and an OmniSky Minstrel V wireless modem.

—Will Smith



The Blackberry definitely has the better screen, but its wheel interface is a little clunky.



The T900 is basically just a prettied-up, two-way pager with an e-mail address tacked on.

THE SPECS
MOTOROLA T900
FEATURES
Lighted keyboard,
250 address book entries,
alarm clock,
4-line backlit display

THE SPECS
RIM BLACKBERRY
FEATURES
Intel 386 processor,
16- or 20-line backlit display, 5MB Flash memory, internal rechargeable lithium battery

T900 PLUSES
Receives messages anywhere

MINUSES
Bad interface
S-l-o-o-o-w
No PIM features

BLACKBERRY PLUSES
Use your own e-mail
Wide coverage area
PIM built in

MINUSES
Bad key layout
Expensive
Limited applications

MOTOROLA T900 — **5**
$130 ($20/month for 400 messages) | Motorola
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1008

RIM BLACKBERRY 957 — **7**
$500 ($50/month for unlimited messages) | RIM
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1009

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrig

Wireless

Wireless Home Networking

Technology laughingstock finally comes of age

Ever since our offices were moved from a bright, airy room on the top floor to a dark, dank room on the bottom floor, we've longed for the chance to use our notebooks in the sunny Imagine Media atrium. First we asked our IT department to install a network port at our favorite picnic table, but that plan was nixed for "security reasons." Then we tried the original Diamond Homefree wireless networking kit, but that wouldn't work because the atrium is more than four feet from our desktop systems. The wireless Homefree kit, you see, had piss-poor signal strength.

But that was a year ago. Today, we have renewed hope, care of two 802.11-based wireless networking kits, the Lucent ORiNOCO (**www.lucent.com/orinoco**) and the SOHOware CableFree NetBlaster (**www.sohoware.com**). Both kits include hubs that connect to a single main computer, wired network, or broadband connection, and transmit data to all the satellite machines on your wireless network. Each satellite machine needs to be equipped with a NIC that features a tiny antenna for data transmission. While the ORiNOCO kit includes one PCMCIA-based NIC, the SOHOware hub doesn't come with any NICs, so you can purchase whatever cards suit your needs, whether they're PCMCIA, PCI, or ISA.

After being bitten by the old Diamond kit, we're skeptical of the new kits' performance claims. Could the modern technology send an uninterrupted stream of data out of the *Maximum PC* newsroom, through the deli line, past the palm fronds, and into a notebook sitting in the middle of the atrium? Yes, indeed. We were absolutely stunned at the performance and reliability of these systems.

To test speed and range, we stationed the hub units in the Lab. Then signal quality and throughput were measured in the Lab itself, in the atrium, and upstairs on the opposite side of the building (one floor up and about 250 feet away). Our speed tests showed that both products performed equally well when placed directly next to the hub, with peak download rates of around 125KB/sec. When we moved our satellite notebook upstairs to the opposite side of the building, the hubs pushed a 75KB/sec signal (in this location, the connection-quality software provided with each kit registered a signal strength of about 35 percent). Since our building is chock full o' computers that can add gobs of EMI interference, we were quite pleased with the results.

To mimic a typical work environment, we fired up a Cisco Aironet 4800E hub in the Lab. The 4800E is 802.11-compliant and rated for speeds up to 11Mbps. While the ORiNOCO's PCMCIA card had no problem connecting to the Aironet, the NetBlaster's card consistently refused to connect and didn't provide an interface that would allow us to connect with a non-SOHOware kit. Gah!

While the NetBlaster simply acts as a wireless segment of a normal network, the ORiNOCO can double as a broadband router, allowing you to hook multiple computers to one broadband connection (SOHOware's Broadband Internet Gateway adds this functionality to the NetBlaster, but jacks up the price of admission by another $200). Unfortunately, we reviewed a pre-release version of the ORiNOCO, and its router functionality didn't work properly with our particular DSL line. Lucent assured us the product's compatibility problems would be fixed in time for the final release. That was OK with us, because for the purpose of this feature, we wanted to test the product's basic wireless capabilities. Our conclusion? Wireless networking works as advertised.

These two kits are virtually identical, save for the NetBlaster's incompatibility with non-SOHOware products and lack of router features. Both kits are worthy products, but if you want to use your 802.11 card at both home and work, the ORiNOCO is your only choice.

—Will Smith

THE SPECS
ORINOCO FEATURES
- 11Mbps 802.11b-compliant
- No set node limit, 10 recommended
- Available in PCI, PCMCIA, and ISA

THE SPECS
NETBLASTER FEATURES
- 2Mbps, 802.11-compliant
- 16 nodes per network
- Available in PCI, PCMCIA, and ISA

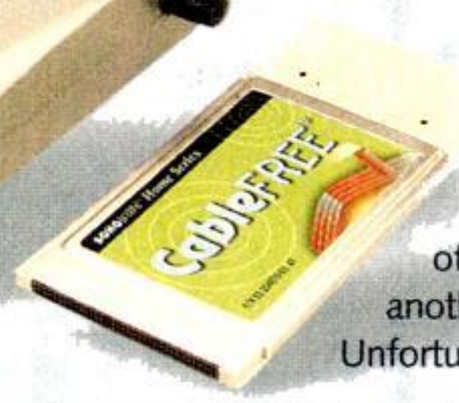
ORINOCO PLUSES
- Fast
- Routes broadband connection
- Looks cool

MINUSES
- Expensive

NETBLASTER PLUSES
- Fast
- Smaller hub

MINUSES
- Incompatible with other 802.11 devices
- Lacks router features
- Expensive

Not only does it look nice, but the ORiNOCO gives you the ability to seamlessly roam from home to work.



If you're looking for a home-only solution and don't need router features, check out the CableFree NetBlaster.

ORINOCO RG-1000 — **9**
$450 (extra NIC prices vary) | Lucent
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1004

CABLEFREE NETBLASTER — **8**
$290 (extra NIC prices vary)
SOHOware
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1034

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

How to Pick the Right Wireless Gadget

By now you know the promise of wireless technology and you've read our reviews of gear that's actually shipping today. But what are our bottom-line recommendations for integrating all this wireless schwag into your lifestyle? Which type of device is absolutely perfect for your fancy-free needs? Here's the breakdown...

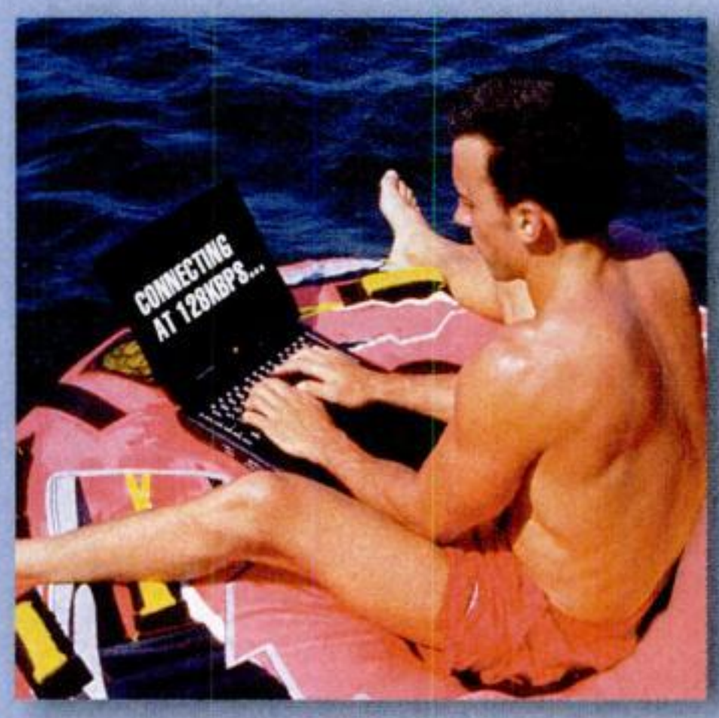
Although being able to access the Internet from your cell phone is very, very cool—and definitely raises your Gadget Geek Quotient to near Q-Branch proportions—we're betting that the current crop of net phones will lose their luster when the novelty wears off. Sure, being able to check the weather or send e-mail from your phone is très cool, but today's phones are relatively limited in functionality and are almost useless for browsing sites that aren't WAP-enabled. Our off-the-cuff estimate of the total percentage of WAP-enabled sites is somewhere between 0.0000002 percent and none. We're talking two parts per million, in the vast Internet ocean scheme of things.

Nonetheless, if you're about to buy a new cell phone, it would be foolish to buy one that isn't net-ready. After all, you won't want to be left holding an old-school phone should an avalanche of WAP-enabled web sites begin rolling through net space. So, when you're purchasing a new net phone, make sure to buy one with a T9 keyboard, which greatly increases the speed at which you can enter URLs and e-mail messages into the phone. And if you take the time to personalize your phone's T9 dictionary, data entry moves that much more quickly.

If you're simply looking for wireless e-mail access, your best bet is to convince your company to set you up with a RIM Blackberry. However, if you think you won't need 24/7 access to your work e-mail account or that such a fringe benefit won't fly with the bean counters at the home office in Toledo, you can purchase a Blackberry yourself—just make sure to sign up with an approved ISP for full synching services. The Blackberry's ability to synchronize e-mail (including previously read messages) between the server and the device itself is almost magical. Unfortunately, the Blackberry's tiny keyboard, limited functionality, and high price make it a dubious choice for anyone who needs full PDA features. Which leads us to our one unconditional thumbs-up...

When you team the OmniSky Minstrel V wireless modem with a Palm V or Palm Vx, you have the perfect balance of portability, PDA functions, and quick access to the largest pool of wireless-ready net content. While the Palm VII requires you to download PQAs from your desktop cradle, you can access them wirelessly, on the fly, with the OmniSky. The OmniSky even makes an admirable effort to render *non*-PQA'd web sites, which means the entire WWW is potentially within your wireless reach. And, unlike the Palm VII, OmniSky lets you check POP3 accounts.

Of all the devices mentioned in this article, the Palms offer the best text display and input. By using the Palm's Graffiti character-entry system, you can write an entire e-mail in less time than it takes to peck out "Hey Jimmy," on one of the tiny keyboards found on all the other wireless devices. With coverage in most urban areas, the OmniSky is a must-have accessory for the Palm V owner.



We're a long way from shaking hands with the Wireless Dude featured on page 33, but in the next five to 10 years, average consumers should have access to his technology, or at least a reasonable facsimile of it. Bluetooth technology is a precursor to Wireless Dude's PAN, although the Bluetooth 1.0 doesn't offer enough bandwidth to transfer video at a reasonable rate. In the next year, look for different companies to release Bluetooth devices, all of which should be able to communicate with each other. 2001 may not be the year in which the wireless PAN fully congeals, but it could be the make-it-or-break-it year for Bluetooth.

Right now, you can go out and buy technology that will dish you information around the clock, whether you're cutting through Lake Tahoe in a speedboat or avoiding shoulder collisions on the sidewalks of Manhattan. Today's devices will eventually be viewed as primordial relics of the nascent wireless revolution, but they more or less work—once you understand their basic limitations. The questions you need to ask yourself are: "What information do I want, and what am I going to do with it?" Make sure you invest in the right device for your needs, and don't buy anything without first taking a test drive. ✹

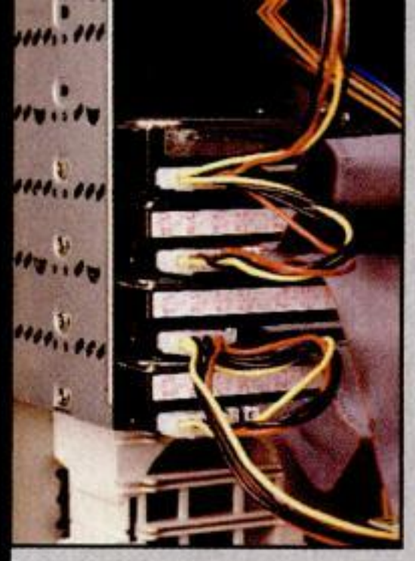
BEFORE YOU BUY...

Ask yourself these questions:

- ▶ Does the device offer a sufficiently large text display and long-enough battery life?
- ▶ How easy is it to enter data?
- ▶ Does the device also function as a general-purpose PDA?
- ▶ How wide is the device's service coverage?
- ▶ Is service prone to untimely drop-outs?
- ▶ Will I have to pay extra for every byte of downloaded info or every minute of use?

Make sure to answer all these questions with your own hands-on use!

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.



The RAID Report

DOIN' DOUBLE DUTY

By Josh Norem

RAID arrays harness the muscle of multiple hard drives for serious performance gains. We tell you how it works and how to set up a RAID array of your own.

There comes a time in most power users' lives when even the biggest, fastest hard drive doesn't seem big or fast enough. More storage space, better data security, increased throughput—a RAID array will give you benefits no single hard drive can match.

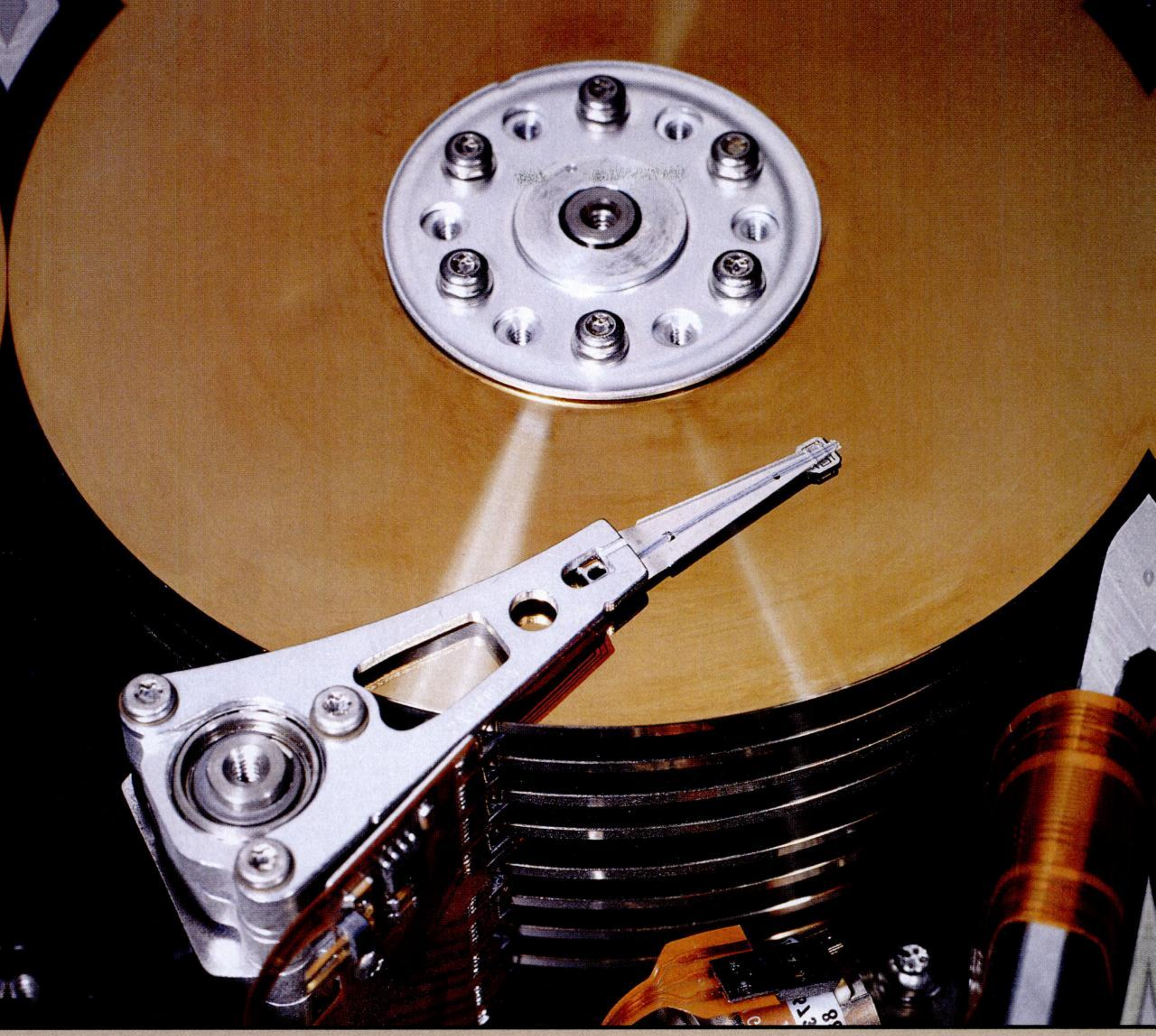
WHAT IS RAID?

A single hard drive is limited in terms of what it can accomplish. It has a set speed and capacity, and a level of security that's only as good as the drive is reliable. If you want more storage capacity or faster disk performance, you can shell out the bones for a bigger, faster drive, but this strategy demands that you open your wallet every time you reach a size or performance plateau. You might do better to consider a longer-term solution, such as a RAID array.

In a RAID array, two or more hard drives work together as a single volume to provide performance options that simply aren't possible with a single drive. Depending on the type of RAID array you implement, you'll see increased performance, better data security, or both.

RAID stands for Redundant Array of Inexpensive Disks—an accurate description of what RAID is and does (though the "Inexpensive Disks" portion of the phrase has been something of a misnomer until relatively recently). Redundancy is the cornerstone of a RAID setup—it simply means that the array includes drives specifically designed to back up the system's primary drive every time data is written to that main drive. Redundancy can be implemented in a variety of ways (some of which are outlined on the next page), but its primary purpose is always the same: to minimize the downtime incurred by a drive failure. Every legitimate RAID array will offer some form of protection against data loss.

Copyrighted material



The word "array" implies a setup in which several components have the same properties, and RAID is no exception. However, it's important to note that a RAID array can only operate at the level of the smallest or slowest drive included in the setup. That means a 7,200rpm drive hooked up to a 5,400rpm drive will yield an array that operates at 5,400rpm, and a 40GB drive working with a 20GB drive maxes out at 40GB (20GB per drive). The moral of the story? Happy power users have RAID arrays that include multiple drives with identical specs.

A RAID array's work is governed by a controller that handles the task of sending and receiving data requests to all the drives. The controller can be hardware- or software-based—if you use Windows NT Server or 2000 Server, your OS can act as a software controller—but we recommend an add-in PCI controller card for top performance, since a software controller steals CPU cycles for basic operations. Hardware controllers include onboard processors that handle the functions of an array, leaving your CPU and other system resources free to handle other tasks. All controller cards are bundled with a monitoring utility that provides details on the array's status.

RAID BASICS

While redundancy is the cornerstone of a RAID array, increased performance and security benefits are also paramount. There are many ways to configure a RAID array, but all RAID setups employ at least one of the following features.

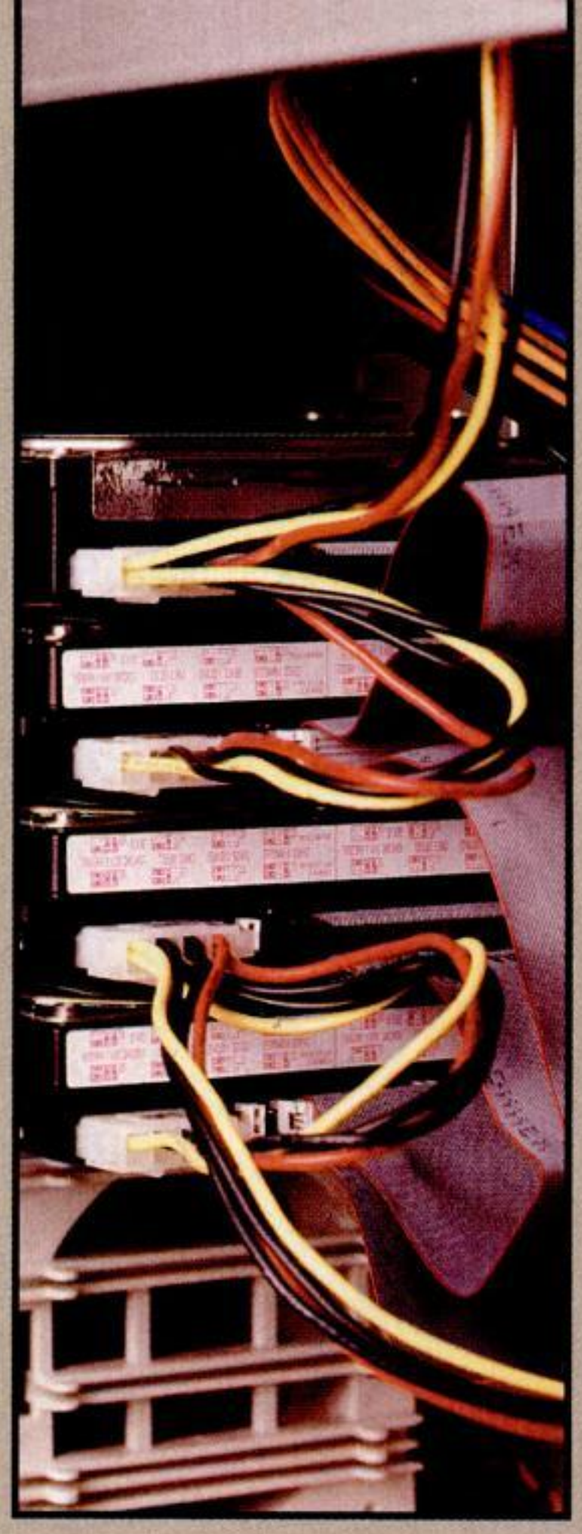
Striping In a striped RAID configuration, data is interleaved, or woven, across all the drives in the array. The chunks of data being written to the drives, were they visible, would appear as stripes running across all the drives in the array.

Because all the drives in a striped array write and read data simultaneously, the array yields faster overall throughput. Here's another way to look at it: Imagine that you want to write the digits 1 through 10 on a piece of paper, as quickly as possible. With one

Copyrighted material

hand, you could write one number at a time. But if you were able to use both hands simultaneously, with one hand writing even numbers and the other writing odd numbers, you'd finish in half the time.

A striped array's performance is dictated by two factors: stripe width and stripe size. The width of the stripe is equivalent to the number of drives in the array. To understand how this affects performance, consider the following example: If a 256K chunk of data is written onto two drives in 64K chunks, each drive would be required to perform two writes—one drive would write the first and third 64K chunks, and the second drive would write the second and fourth 64K pieces. As soon as the first drive finishes writing a chunk, it begins writing another, and the other drive does the same. The result is that each drive's work is halved, and transfer rates are nearly double those of a single drive. With each increase in an array's stripe width (that is, with each additional physical drive), performance is increased as more drives share the workload.



You can find more information on stripe size and its effect on a striped array's performance on page 49.

Mirroring In a mirrored array, data is simultaneously written to two drives. The result is a secondary drive that's equipped to replace an ailing or failed main drive. If a system's RAID controller allows it, that replacement can happen almost instantaneously. If not, the rotten drive must be physically removed and replaced with a functional drive, to which the backup drive then transfers all of its data.

Mirroring typically makes for slower write speeds than if you were writing data to a single drive. And why wouldn't it? The data has to be written to two drives instead of just one. However, mirrored drives usually yield better read speeds than those of a single drive (though not as good as the read speeds of striped drives). Because the two mirrored drives carry identical data, the controller can retrieve data from one drive while simultaneously sending commands for additional data to the other drive.

Parity Like mirroring, parity is a redundancy measure. In parity mode, the array's controller adds an extra bit of data to the binary information that's being written to the hard drive. When calculated by the controller, the extra sequence results in an even or an odd number. By analyzing this value, the controller can determine whether the information's integrity has been compromised and, if so, repair it instantly by replacing it with non-compromised data from another drive in the array.

Currently, the most popular method of implementing parity in a RAID array is to use a mathematical operation called eXclusive OR, or XOR for short. XOR is a Boolean logic operator that analyzes a string of values—in this case, binary computer data represented by ones and zeroes—and returns to the RAID controller a value of either true or false (odd numbers are true, even numbers are false). XOR is especially useful because it can reconstruct binary data that's been corrupted; if XOR has at least some details of an operation, it can fill in the data that's "missing."

Here's a representation of how XOR does its thing: Consider the operation 2 + 3 = 5. If those numbers represent data, and the number 3 is somehow taken out of the equation (that is, it's corrupted), you're left with an equation that reads 2+"blank"= 5. Obviously, the answer is 3. And that's how XOR works: It uses two parts of a three-part equation to determine the missing third part.

Levels of RAID

The original specification for RAID, produced in 1988 at the University of California at Berkeley, described five RAID "levels," each designed to deliver a variety of different performance benefits. Aptly identified as RAID levels 1 through 5, the five original levels now act as blueprints for other RAID levels, including the most popular configuration for home users—RAID 0. Since the most commonly implemented RAID configurations are RAID 0, RAID 1, RAID 0+1, and RAID 5, we'll describe those in more detail.

RAID 0 (a.k.a. striped array)

A RAID 0 array contains at least two drives, and data is written across the drives in consecutive blocks. Drives in a RAID 0 configuration are called a "striped set." Technically, RAID 0 isn't really RAID, since it's missing the "R" (redundancy). For this reason, RAID 0 is rarely used by large corporations or in situations where mission-critical data must be protected.

The benefits of RAID 0 are increased read and write speeds, as explained above in the description of striping. The main disadvantage is that corrupted data on a single drive can hose

RAID LEVEL	A.K.A.	MINIMUM DRIVES REQUIRED	ADVANTAGES	DISADVANTAGES	NATURAL APPLICATION
0	Striped array	2	Significant improvement in read/write speeds over those of a single drive	No redundancy	Environments with lots of random access; desktop computing
1	Mirrored array	2	100% redundancy, faster possible reads than those of a single drive	Slower writes than those of a single drive; expensive	Web servers; desktop backup
5	Striping with distributed parity	3	Striped performance with the security of parity	Parity calculations can slow write times; expensive if done in SCSI	Enterprise servers

Copyrighted material

the whole array. RAID 0 is usually used in non-critical environments that require fast writes and reads, such as digital video capturing and editing, working with large multimedia files, or high-end gaming machines and workstations that value performance over security.

RAID 1 (a.k.a. mirroring)

A RAID 1 array contains at least two drives and all data is written to both drives, creating a backup drive that contains a mirror image of the main drive. The controller oversees the mirroring operation. If the main drive takes a tumble, the controller reroutes work to the backup drive until the bunk drive can be replaced. RAID 1 offers straight-up redundancy, nothing more.

RAID 1's benefits include the safety net of full redundancy and improved read times, as explained above in the description of mirroring. Its disadvantages include slower write times compared to those of a single drive (also explained above). RAID 1 is suitable for small corporate networks, small web servers, and people who don't need massive amounts of storage space but require 100-percent redundancy.

RAID 0+1 or 1+0 (a.k.a striping and mirroring)

This configuration requires at least four drives; two are striped together, and two provide mirror images of the striped drives. This addresses RAID 0's lack of redundancy and is the only option for IDE users who want the speed and safety of striping and redundancy.

The advantages of RAID 0+1 are increased read and write times and full redundancy. The downside is the cost—obtaining four identically equipped drives isn't a cheap prospect. This setup is typically employed by entry-level web servers, home users, and small businesses.

RAID 5 (a.k.a. striping with distributed parity)

RAID 5 offers a sumptuous buffet of benefits, including the high performance of striped disks and the security of parity calculations. At least three drives are required, and both data and parity information are interleaved across all the drives in the array—hence the name "distributed parity."

It's easy to understand why RAID 5 is usually incorporated into corporate servers and mission-critical computing environments. Its advantages include speedy disk reads and writes and a serious security setup. Since parity information is distributed across the array, if one drive bites the dust, the missing data can be reconstructed on the fly using the parity information that's written on the other drives. RAID 5's major disadvantage is cost. For the most part, only high-end SCSI RAID controllers are equipped to handle this setup, which means less-expensive IDE hard drives are out. RAID 5 is traditionally deployed in "enterprise" computing environments that require terabytes of storage space and minimal downtime.

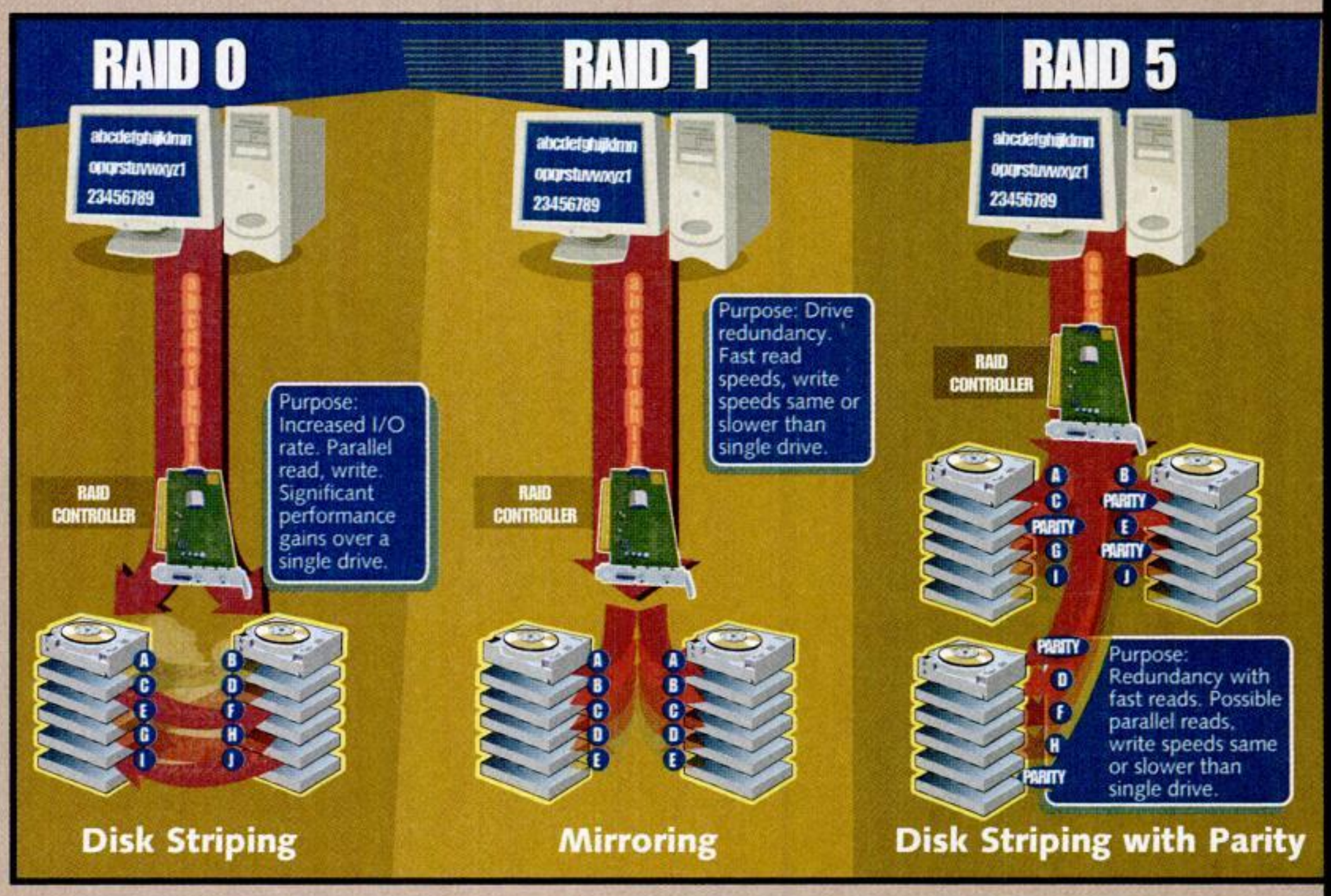
IDE versus SCSI

The previously pitiful performance of IDE drives (at least in comparison to SCSI drives) has traditionally made IDE-based RAID a laughable prospect. But now, the price and performance of ATA/66 and ATA/100 IDE drives are making IDE RAID configurations a viable—dare we say, attractive?—alternative to SCSI RAID.

Compared to IDE RAID, SCSI RAID offers greater configuration options, better reliability, and enhanced throughput. It also offers a price tag that could be mistaken in some states for a down payment on a house. The SCSI RAID controller we attempted to use in Dream Machine 2000 costs close to $700 (an IDE RAID controller is approximately $100). When you add that to the fat sticker prices of a few SCSI hard drives (don't forget, you'll need more than one), the lure of SCSI RAID wanes a bit.

IDE RAID is relatively inexpensive compared to a SCSI setup, and if you judge it against other IDE drives, you'll see that it yields outstanding performance. Need convincing? Two ATA/100 IBM 75GXP hard drives in a RAID 0 configuration outperformed Dream Machine 2000's single 15,000rpm Seagate SCSI drive—and cost several hundred dollars less. It's true that IDE RAID can support a total of only four drives, while SCSI RAID can support up to 60 drives. It's also true that very few hardware-based IDE controllers support RAID 5. But it's doubtful anyone using IDE drives is interested in such configurations.

Overall, we think IDE RAID's impressive performance and low cost make it the most viable option for most people, so our performance testing and how-to sections focus exclusively on an IDE RAID setup.


RAID 0
RAID 1
RAID 5
abcdefghijklmn
opqrstuvwxyz1
23456789
RAID CONTROLLER
Purpose: Increased I/O rate. Parallel read, write. Significant performance gains over a single drive.
Purpose: Drive redundancy. Fast read speeds, write speeds same or slower than single drive.
A C PARITY G I
B PARITY E PARITY J
PARITY D F H PARITY
Purpose: Redundancy with fast reads. Possible parallel reads, write speeds same or slower than single drive.
Disk Striping
Mirroring
Disk Striping with Parity

When data is written to a striped array, all of the drives work in parallel to complete the task. This is one of the principle purposes of RAID—many small drives working together to outperform a larger, more expensive drive.

Mirroring is a basic redundancy measure by which a primary drive has a backup drive mirror all of its contents. Each time data is written to the main drive, it's written to the mirror drive as well to provide 100-percent redundancy.

This is the Big Daddy of RAID. Not only does it offer the speed of striping, but it includes the safety of parity as well. The downside of this setup is that it costs mucho dinero to implement and is usually only offered in a SCSI configuration.

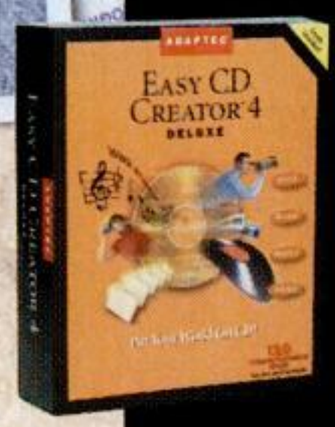
Copyrighted material

CD RECORDING

BEYOND THE ORDINARY

Upgrade to the Deluxe edition of Easy CD Creator™ 4 and greatly expand your CD recording capabilities

The software bundled with your CD-R/W drive has capabilities that are - well, kind of ordinary. But with a simple upgrade, you'll step way beyond everyday CD recording. Record from analog sources like records and cassettes. Download MP3s from the Web. Put photos and videos on CD. And not just record, but enhance them - with your own edits and special effects. You can even use features like Take Two™ to back-up your entire hard disk in 3 easy steps, giving you the tools to quickly recover from crashes or virus infections.



Open up a new world of CD Recording with an upgrade to Easy CD Creator™ 4 Deluxe and finally realize your CD-R's full potential. Available from your local retailer or contact us at 1-800-442-7274.

Visit www.adaptec.com/easy3

roxio

performance software from Adaptec®

©2000 Adaptec, Inc. All rights reserved. Adaptec, the Adaptec logo, the Adaptec tagline, Easy CD Creator, and Take Two are trademarks of Adaptec, Inc., which may be registered in some jurisdictions. All other trademarks used are owned by their respective owners. Our software is designed to assist you in reproducing material in which you own the copyright or have permission to copy from the copyright owner.

Copyrighted material

HOW TO SET UP AN IDE RAID ARRAY

If you're looking to cook up a RAID array, you'll need to stock up on the following items:

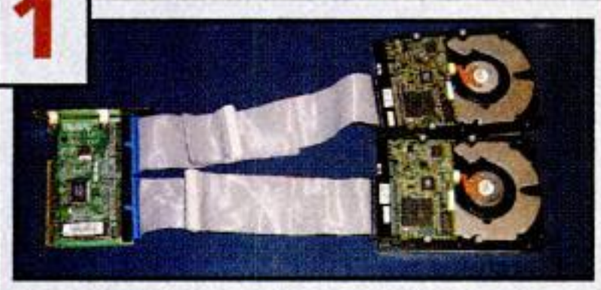
Bootable floppy You'll need to boot your pristine new volume and prep it to receive all the data goodness stored on your hard drive backup CD. For details on creating a bootable floppy, check out **www.maximumpc.com/reprint/clean_start/cleanstart3.html**. You definitely, *definitely* want to do this before proceeding with the RAID setup. Please don't send us angry e-mails if you forget to make a floppy, because it hurts our feelings.

Media for backing up your hard drive That's right—unless you're setting up a RAID 1 array designed to simply mirror what's on the drive you already have, setting up a RAID array is essentially installing a tabula rasa. Which means that everything on your current hard drive will be gone-daddy-gone if you don't back it up first. We suggest creating an image of your drive and loading it onto a CD—a good practice even if you're not planning to set up a RAID array, since it protects you against unforeseen disasters. Our June cover feature, "Clean Start," describes this process in detail, but you can also find it online at **www.maximumpc.com /reprint/clean_start/index.html**. If we were you, we wouldn't go any further with the RAID process before creating the backup CD. Do you see where we're going with this?

IDE hard drives How many you need depends on the array you're setting up, but two is the minimum. Remember—your array will only perform as well as your smallest, slowest drive. For RAID that rocks, build an array that's made of identically equipped drives.

Hardware controller Since you'll need to choose a controller that matches your hard drives' ATA speed, your options will be somewhat determined by the drives going into your array. Is the jump from ATA/66 to ATA/100 really worth it? Check out the next page, where you'll find reviews of two controllers and head-to-head performance details on ATA/66 versus ATA/100 RAID.

1



Connect the RAID controller to the hard drives using standard 40-pin ATA cabling. When using two drives, place each drive on its own ATA channel; for a four-drive configuration, attach two drives to each ATA channel.

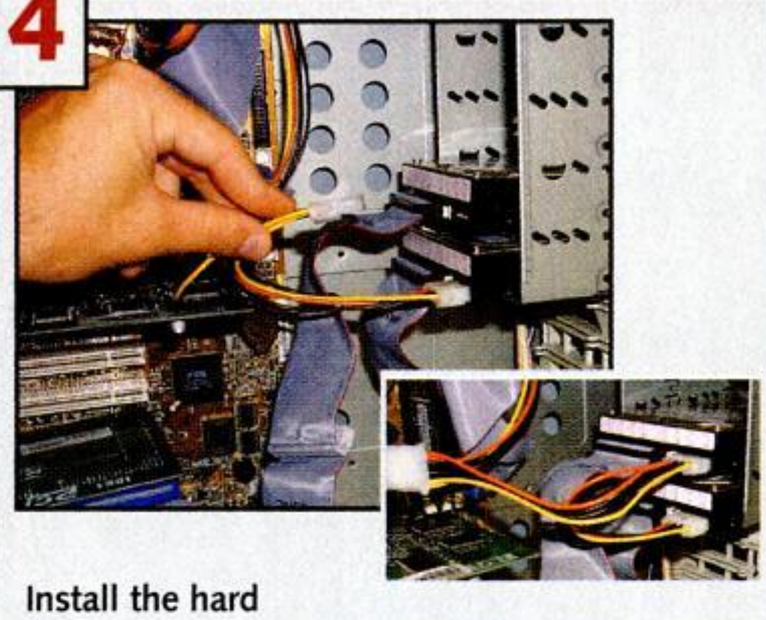
2

Set the hard drives' jumpers. The jumpers on the drives should also be set according to the number of drives in the array. In a two-drive setup, both drives should be set as Masters. In a four-drive setup, each channel should house one Master and one Slave apiece.

3

Seat the controller in an open PCI slot (see sidebar on RAID tips).

4



Install the hard drives. Attach their power connectors and seat the drives inside your case.

5

Boot the PC. Just after your BIOS screen appears, you'll find yourself in your hardware controller's utility program. A message will likely tell you that your "Array is undefined" and ask you to do some configuring. You're likely to see such options as "Set type of array" (striped, mirrored, etc.), which you should do.

6

Insert bootable floppy in disk drive and reboot.

7

Use the FDISK utility to set partitions on the array, then format the volume in whatever way you wish.

8

Load your spanking-new hard drive with the backup image you stored on a CD.

9

Monitor your array to your heart's content, using the monitoring utility that came with your controller. The utility will likely report all of your array's vital statistics, such as size, RAID level, etc.

Copyrighted material

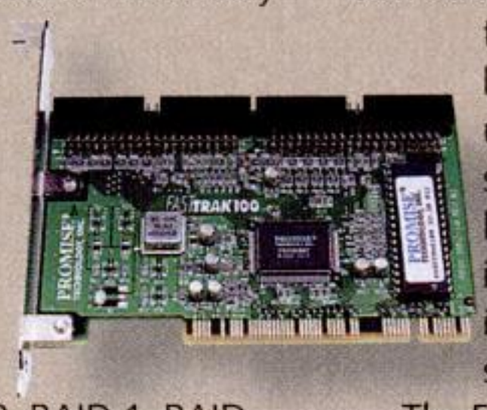
IDE Controller Cage Fight

The market isn't exactly teeming with IDE RAID controllers, but there are a few options to choose from. Promise, AMI, Iwill, Abit, and Adaptec all offer controllers, though only Promise, Abit, and AMI sell ATA/100 flavors as of this writing. Adaptec's card is unique because it's the only card that supports RAID 5. IDE RAID is also becoming available onboard some of the new motherboards, including the Abit BX133, the Iwill VD133Pro, and KV200-R for Duron boards. Software RAID is only supported in Windows NT/2000 Server and Linux.

We took a look at two controllers and checked out the performance differences between ATA/66 and ATA/100 RAID arrays. We tested each controller in a RAID 0 and RAiD 1 array, and measured each setup's performance against that of a single hard drive.

Promise FastTrak 100 IDE RAID controller

We've been impressed with Promise's past offerings, and the FastTrak 100 (**www.promise.com**) didn't let us down. Installation was flawless, performance was exactly what we expected, and the documentation accompanying the card is extensive, easy to understand, and makes damn fine reading for the geek-minded.



This dual-channel PCI card supports RAID 0, RAID 1, RAID 0+1, and RAID JBOD—Just a Bunch of Disks. Also known as spanning, JBOD offers no performance benefits, but does allow you to use the full capacity of each disk in the array (remember, in a typical RAID array, if you pair a 10GB drive with a 30GB drive, the 30GB drive is forced to operate as a 10GB drive, so you lose 20GB of storage). The FastTrak 100 is an ATA/100 RAID controller, but is backward-compatible with ATA/33 and ATA/66 hard drives. Arrays are configured using the card's *FastBuild* utility, which offers a wizard for newbies and a manually adjustable selection screen that lets experienced users tinker with settings on a deeper level. A slick, Windows-based utility also lets you check the status of the array, sync data between mirrored drives, or initiate the rebuilding process if a drive fails and must be swapped out.

The FastTrak 100's performance in RAID 0 was sensational, offering read speeds that put even Ultra SCSI drives to shame. Our two-drive, IBM 75GXP RAID 0 array's average read speed of 38MB/sec beat even that of the mighty Seagate X15 SCSI hard drive used in Dream Machine 2000.

Overall, we're impressed with the FastTrack. It's got everything we could ask for from an IDE RAID card.

DARE TO COMPARE PROMISE

HD Tach 2.60	Single IBM 75GXP	Two IBM 75GXP in RAID 0	Two IBM 75GXP in RAID 1
Random access time (ms)	13.3	12.8	10.9
Average seq. reads (MB/sec)	28.4	38.4	28.4
Read burst speed (MB/sec)	60.1	85.8	84.6
CPU usage (%)	4.5	8.8	8.4
*Quake III**	38.1fps	38.1fps	38.1fps
Time to copy 649MB (in seconds)	94	83	113

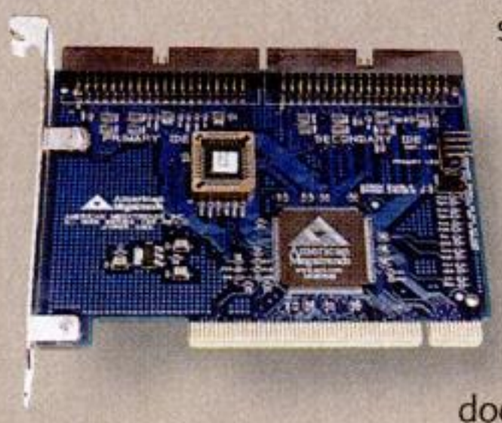
**Quake III* tests were performed using demo 001 on a P-III 733 test bench, 1024x768,32-bit color, triple buffering, high geometry.*

MAXIMUM PC VERDICT 9

$124 | Promise
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1012

AMI ATA/66 HyperDisk

We instinctively have doubts about products called Hyper or Extreme, and AMI's ATA/66 HyperDisk IDE RAID controller (**www.ami.com**) justified our concerns. Although the HyperDisk has many of the same specs as the Promise controller—two channels and support for RAID 0, RAID 1, and RAID 0+1—its installation was far more problematic, and its desktop performance noticeably worse, than that of the FastTrak.



Configuring the array went off without a hitch, but re-installing all the data from our backup CD took an excessively long time. Fearing something was amiss, we consulted the installation manual and found the following sage advice: "Step 1: Unpack controller. Step 2: Turn off computer, remove side cover. Step 3: Configure your BIOS for card." Sorry, was that "Turn off the computer, then configure the BIOS"? Right-o.

Once we finally got the array up and running, we attempted to install *HyperDisk Spy*, the monitoring utility that's bundled with the controller. We never got it to run. And, though we never suffered a blue screen or General Protection Fault, our system seemed to run in slow motion; the array took forever to boot and suffered from IRQ conflicts on several occasions. It appears that this AMI card just didn't like our Intel VC820 motherboard. It might work fine with other mobos, but it doesn't appear to offer the same level of compatibility as the Promise card.

To its credit, the HyperDisk's performance in our benchmarks was fantastic for an ATA/66 setup. But, since real-world testing proved difficult—and since Promise offers an ATA/66 controller that kicks booty—we see no reason to recommend the AMI HyperDisk 100 at this time.

DARE TO COMPARE AMI

HD Tach 2.60	Single IBM 75GXP	Two IBM 75GXP in RAID 0	Two IBM 75GXP in RAID 1
Random access time (ms)	13.2	12.6	13
Average seq. reads (MB/sec)	28.4	33.4	28.5
Read burst speed (MB/sec)	60.1	53.3	53.2
CPU usage (%)	4.5	23.6	19.1
*Quake III**	38.1fps	38.8fps	38.1fps
Time to copy 649MB (in seconds)	94	83	220

**Quake III* tests were performed using demo 001 on a P-III 733 test bench, 1024x768,32-bit color, triple buffering, high geometry.*

MAXIMUM PC VERDICT 6

$110 | AMI
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1013

Copyrighted material

ESSENTIAL TIPS FOR BUILDING RAID

When designing an IDE or SCSI RAID system, it's wise to keep these points in mind:

▶ Your motherboard must have a robust, reliable bus-mastering DMA sequencer. Bus mastering is a technique that allows a controller, such as a RAID card, to communicate with other devices on the bus without first demanding attention from the CPU. DMA (Direct Memory Access) is a technique for shuttling data from main memory to a device without first demanding attention from the CPU. Each PC has eight available DMA channels, four of which are primed for bus-mastering. The DMA sequencer assigns the PC's bus-mastered DMA channels to the bus-mastering PCI slots. You'll want your RAID card in one of these slots.

If you're building a RAID machine from the ground up, you should first pick your RAID card, then look on your card manufacturer's web site for recommended motherboards. We've found Intel, Iwill, SuperMicro, and Gigabyte boards to be reliable, but we've been disappointed with boards from such reputable companies as Asus, whose dual-proc board didn't have a sufficiently substantial sequencer for our RAID card to work (in previous testing).

▶ Mind your IRQs. This is especially important if you have a second SCSI card in the system. You'll always have particular slots that share IRQs and DMAs, and some slots are bus-mastered, while others aren't. The RAID card must always be in the first bus-mastered slot. The easiest way to determine which slots are bus-mastered is to read your motherboard manual; some manufacturers start the bus numbering from the ISA slot up, while others start from the AGP slot down. If you've purchased a quality motherboard, its manual will describe where your slot numbers begin and which ones are bus-mastered. Your RAID card will always want first dibs on IRQs and DMAs. If you have a PCI videocard, put the RAID card above it on the PCI bus (that is, the RAID card sits in the first bus-mastered slot, and the videocard sits in the second). If you have an AGP card, keep an eye on where your RAID card is. Typically, the first PCI slot below the AGP slot shares an IRQ with the AGP slot, and thus is not a bus-mastered slot. Again, refer to your motherboard manual.

▶ If all else fails, remove all the cards from your system, except for your videocard and RAID card. Now move your RAID card from slot to slot until you find a slot that works properly. Once you find it, reinstall your other PCI cards. If you've built a SCSI RAID array and you have a plethora of other SCSI devices, such as tape and CD-ROM drives, give them their own SCSI controller, so your RAID can run at maximum performance. In that case, if you're adding a second SCSI card to the mix, be sure it's on its own IRQ and not in a bus-mastered slot above the RAID card's bus-mastered slot (usually, in a four-PCI slot board, you have two bus-mastered slots). If the RAID card still doesn't work properly, you either have a bad card or your DMA sequencer isn't capable of handling the RAID card properly.

–Brad Sparks

Brad Sparks is a network engineer for Lightning Computer Inc., Phoenix, AZ

RAID FAQ

In an array that includes striping (RAID 0, RAID 0+1, RAID 5), what's the right stripe size? How does stripe size affect the array's performance?

A stripe size's effect on performance is determined by the specific computing environment in which the array is functioning. For example, a small stripe size will guarantee that a file is broken up into several pieces and distributed across several drives. This ensures greater transfer rates, since more drives are being used, but it also increases the number of times a given drive will have to perform random-access tasks, since more reads are taking place. Simply put, the drive head has to work extra hard, so performance will be degraded when dealing with smaller file sizes.

Not surprisingly, increasing stripe size has the opposite effect on performance. With larger chunks being broken off for each drive to handle, a given file requires fewer drives to be written upon. The result is less parallelism and slower transfers. However, since fewer drives are being used and fewer commands are being sent, the drives are freed up to focus on other requests, thereby increasing their ability to move along quickly to the next task.

Stripe size can range anywhere from a single byte to 512K and higher. As a general rule, people usually employ striping for increased transfer rates, so they set stripe sizes on the small side. A default stripe size for IDE configurations is typically 64K.

Since RAID 0 provides no data protection, is it risky to use?

RAID 0 is no more risky than running a single drive, since there's no redundancy and the array is recognized as a single large drive by your PC. It's true that if either drive in a RAID 0 array fails, the whole array fails. It's also true that relying on two drives instead of just one does slightly increase the chance that you'll experience a drive failure, but only by the slightest margin. Heck, current GMR IDE drives are designed to last for at least five years, so we feel confident that using a RAID 0 with regular backups is just as safe as using a single drive with regular backups.

Do the hard drives in my array really need to be identical?

It's not necessary, but it's recommended if you want to get the most out of your RAID setup. As we explained before, your array will perform only to the level of your smallest, slowest drive. If you match a 40GB drive with a 20GB drive, the entire array will consist of 40GB (20GB per drive); the remaining storage space is useless, so it's a waste of money. Same goes for choosing hard drives from the same vendor—it isn't necessary, but, to ensure compatibility and peak performance, it's recommended.

Will an IDE RAID array conflict with SCSI adapters?

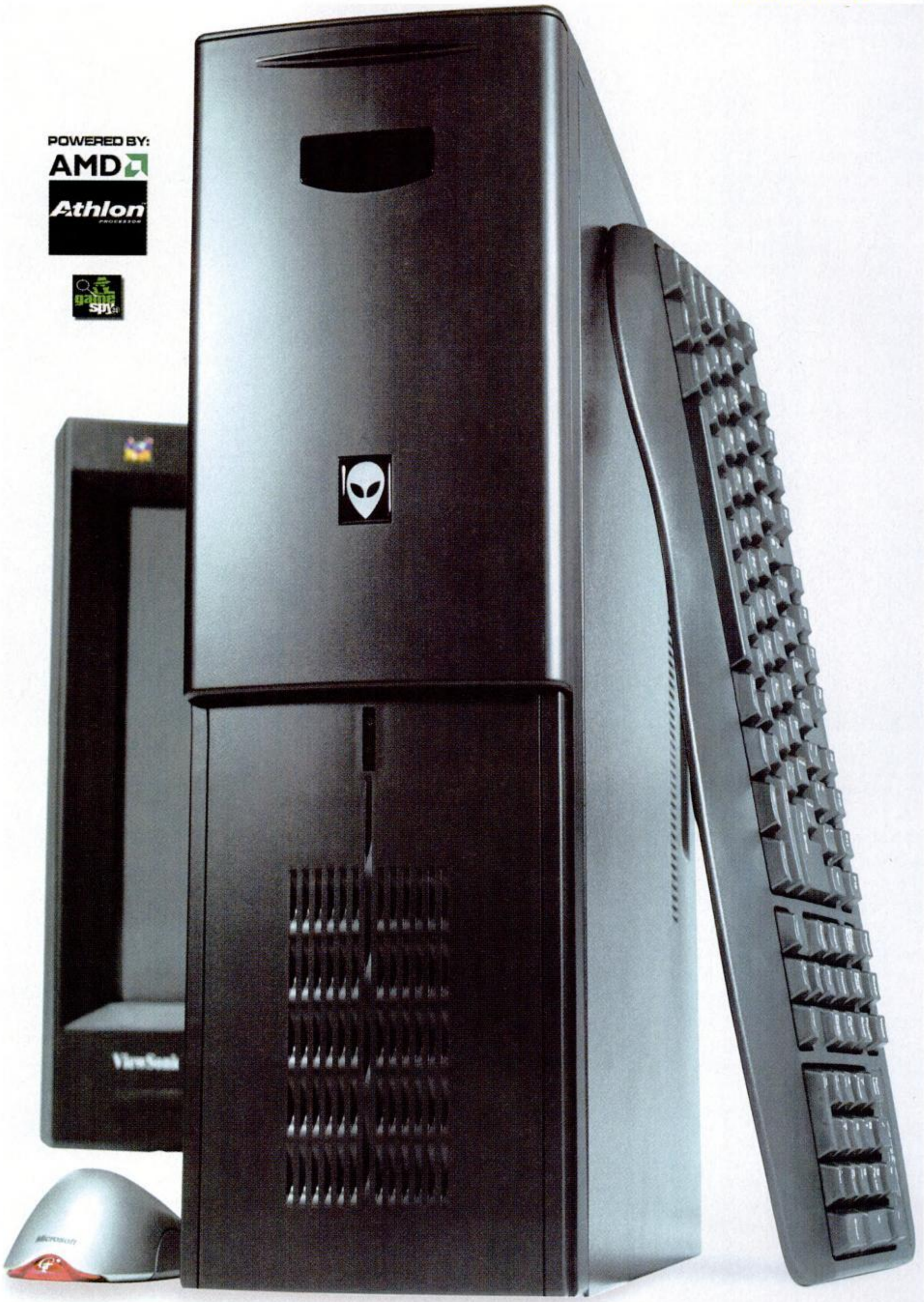
The RAID controller is a PCI device like any other, so no problems should occur. In fact, the system sees the RAID controller as a SCSI device, although it's a PnP device with its own IRQ. We tested our controllers in a system with an Adaptec 2930 SCSI adapter and experienced no conflicts whatsoever.

Copyrighted material

"The fastest PC we've ever tested, bar none!"

- Maximum PC

POWERED BY:
AMD Athlon



ALSO AVAILABLE IN BEIGE

AWARD-WINNING SYSTEMS

Copyrighted material

Looks are nice but performance is everything.

Be a proud owner of an Alienware machine with it's legendary performance. You can rest assure that it will be backed up with 24/7 toll-free, onsite technical support. You can customize it online or have an experienced member of our staff guide you in customizing a machine for your specific needs. Alienware, the fastest system you'll ever use. Our slogan holds true; build it as if it were your own.

GREY

AMD Duron 700MHz Processor
High-Performance Heatsink/Cooling System
VIA KT133 Chipset Motherboard
Kingston 128MB SDRAM (PC-133)
Floppy Drive 1.44MB
15GB 7200RPM Hard Drive Ultra ATA100
Nvidia GeForce w/32MB DDR Video Card
SoundBlaster LIVE! 3D Sound Card
Cambridge FPS1000 Digital
Subwoofer/Speaker System
56X EIDE CD-ROM Player
Hydraulic ATX Mid-Tower Case w/300 Watt
104-Enhanced Keyboard PS/2
Microsoft Intellimouse PS/2
US Robotics V.90 56K Voice/Fax/Modem
Microsoft Windows Millennium OS
1-Year Toll-Free 24/7 Technical Support
with Aliencare On-Site Home Service
Personalized Technical Support Manual
Optimized & Configured for High-Performance
FREE FUNC Technical Surface Pad

$1,299.00
Financing as low as: $28.00mo./60mos.

HIVE-MIND

AMD Thunderbird 950MHz Processor
High-Performance Heatsink/Cooling System
VIA KT133 Chipset Motherboard
Kingston 128MB SDRAM (PC-133)
Floppy Drive 1.44MB
20GB 7200RPM Hard Drive Ultra ATA 100
Nvidia GeForce2 GTS 32MB DDR Video Card
SoundBlaster LIVE! 3D Sound Card
Altec Lansing ACS54 Gaming
5-Piece Subwoofer/Speaker System
Pioneer 16X/40X DVD Player
Hydraulic ATX Mid-Tower Case w/300 Watt
104-Enhanced Keyboard PS/2
Microsoft Intellimouse PS/2
US Robotics V.90 56K Voice/Fax/Modem
Microsoft Windows Millennium OS
1-Year Toll-Free 24/7 Technical Support
with Aliencare On-Site Home Service
Personalized Technical Support Manual
Optimized & Configured for High-Performance
FREE FUNC Technical Surface Pad

$2,299.00
Financing as low as: $53.00mo./60mos.

AREA51: AURORA

AMD Thunderbird 1000MHz Processor
High-Performance Heatsink/Cooling System
VIA KT133 Chipset Motherboard
Kingston 256MB SDRAM (PC-133)
Black Floppy Drive 1.44MB
40GB 7200RPM Hard Drive Ultra ATA100
Nvidia GeForce2 GTS 64MB DDR Video Card
SoundBlaster LIVE! 3D Sound Card
Klipsch 4.1 ProMedia v.2-400 THX
400-Watt Subwoofer/Speaker System
Pioneer 16X/40X DVD Player
HP 9300i CDR-W 10x/4x/32x CD Writer
Hydraulic Black ATX Mid-Tower Case w/300 Watt
Black 107-Enhanced Keyboard PS/2
Microsoft Intellimouse Explorer
US Robotics V.90 56K Voice/Fax/Modem
Microsoft Windows Millennium OS
1-Year Toll-Free 24/7 Technical Support
with Aliencare On-Site Home Service
Personalized Technical Support Manual
Optimized & Configured for High-Performance
FREE FUNC Technical Surface Pad

$3,299.00
Financing as low as: $77.00mo./60mos.

MONITORS

17" Viewsonic G773 .26dp	*$295.00*
17" Viewsonic Q95 .23dp	*$335.00*
17" Viewsonic E790B .26dp	*$395.00*
21" Viewsonic P810 .26dp	*$825.00*

TOLL FREE: 800-494-3382
www.alienware.com

ALIENWARE

ALIENWARE

Copyrighted material

CELERON V

BUDGET CPUs FROM INTEL AND AMD GO TOE-TO-TOE IN OUR WELTERWEIGHT BEAT-DOWN

Let's

Budget processors—such as the Cyrix MII or Intel's original Celeron—were once synonymous with dog-slow performance. But that was before the price of PC technology began its downward spiral. Today's budget procs share nearly the same core architectures as their more expensive siblings and boast clock speeds that seemed unattainable just a year ago. What the welterweights lack are large L2 cache sizes and official support for fast memory buses—though you might be able to circumvent the latter problem if you're willing to dabble in the dark art of overclocking. Indeed, when push comes to shove, budget CPUs are hobbyist CPUs. Buy 'em on the cheap, tweak 'em with impunity.

The new Intel Celeron and AMD Duron land squarely in the redefined welterweight division. So how do they stack up against each other? First, let's take a look at their unique fighting styles, then we'll see how they perform in the ring.

Meet the Duron

AMD engineers are out for blood. The Athlon processor had no trouble knocking the wind out of Intel's Pentium III, so the folks in AMD R&D went back to the drawing board to engineer a second attack. The result is Duron, which is primed to go toe-to-toe with Intel's low-end Celeron.

AMD might have an emotional stake in taking the low-end title belt from Intel. Before Intel introduced the Celeron, AMD's K6-2 line owned the "value" PC arena. In fact, AMD, along with Cyrix and WinChip, helped create the very sub-$1,000 PCs that pushed the prices of all computers to record lows. But when Intel introduced its second-gen Celeron, it knocked the K6-2 to the mat. And why wouldn't it? While the second-gen Celeron shared much in common with Intel's higher-end CPUs, the K6-2 was still an architectural throwback.

AMD simply took the basic core of its celebrated Athlon, moved it to a new 0.18-micron process, reduced its L2 cache size, and called it "budget."

Duron signals payback time. AMD simply took the basic core of its celebrated Athlon, moved it to a new 0.18-micron process, reduced its L2 cache size, and called it "budget." Unlike the original Athlon, which had 512K of external, half-speed L2 cache, the Duron uses full-speed L2 cache integrated directly into the CPU's die. Unfortunately, to ensure that the chip is inferior to the new Thunderbird Athlon with "performance enhancing cache," AMD trimmed the Duron's L2 cache to 64K (the Thunderbird boasts 256K of L2).

With just 64K of L2, one might assume the Duron would be KO'd by the Celeron, which has 128K of L2 cache. Not so, AMD says. Remember, the Athlon and its derivatives also

S DURON: Get It On!

By Gordon Mah Ung

feature 128K of L1 cache. AMD likes to note that the Duron's combined L1 and L2 (192K) blows away the Celeron's combined cache, which hits just 160K (Intel will finally ditch its lowly 32K L1 cache when it moves to the Pentium IV). AMD says Duron also picks up some speed because its cache is mutually exclusive, meaning data in L1 isn't duplicated in L2.

The Duron also bests the Celeron with an extra floating-point pipeline. Perhaps even more significantly, the Duron shares the Athlon's 200MHz EV6 memory bus. AMD says the EV6 gives the Duron three times the bus bandwidth of the Celeron's 66MHz bus and is better suited for data-intensive operations, such as MP3 encoding and MPEG2 decoding.

Duron packaging will be strictly limited to Socket A. While some manufacturers may introduce socket-to-slot converters for the Duron, AMD doesn't approve of such devices.

The name Duron is rooted in the Latin words "durare," which means lasting, and "on," which means unit. So Duron essentially means lasting unit. We liked AMD's Spitfire codename better.

Meet the New Celeron

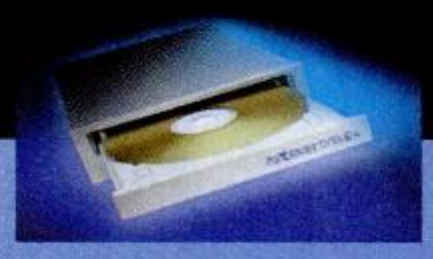
You've probably seen it called Celeron II. While this unofficial nickname sounds logical, it's an inaccurate tag. The latest low-budget proc is actually Intel's *third* iteration of the Celeron. Intel's original Celeron was basically a Pentium II with the external L2 cache removed. Operating without any L2 whatsoever, these procs were dismal failures and had their asses easily handed to them by the K6-2.

Intel retreated and, just two months later, introduced the Celeron A version, using the brand-new Mendocino core. The Mendocino core offered a number of advances, the most significant being the integration of 128K of on-die L2 cache. Because the L2 was on-die, Intel was able to crank up the cache from half- to full-speed. The Celeron A was a hit—it bumped the K6-2 from the sub-$1,000 market and pushed it into the so-called "free PC" market. The processor also became a favorite among system tweakers, who discovered the new Cellie also had about 150MHz of effortless overclocking headroom.

In March 2000, with almost all of its plants churning out P-IIIs on the 0.18-micron Coppermine process, Intel introduced the Coppermine-based Celeron—essentially a Pentium III with half the L2 cache. How's that for a bargain-basement powerhouse? Also, because the CPU is rooted in the Coppermine P-III, the new Cellie also gets the fat 256-bit cache-to-core pathway for improved bandwidth (the Duron features a 64-bit pathway). This new Cellie is also a Flip-Chip PGA, which means Intel literally inverted the core for better exposure to the heatsink and cooling.

The new Celeron's biggest flaw is its ongoing marriage to a 66MHz system bus. What gives? It's not as if PC100 memory is inordinately expensive. Intel's official response is that people shopping

Don't let your CD sessions go to the dogs



If you've got an inefficient drive—and there are many around—excessive speed during a burn session can kill a disc. The faster the drive attempts to burn, the harder it becomes for the drive's buffer to process the data in a continuous manner. The result? Buffer underrun errors, which can bring recording sessions to a screeching halt. When that happens, your CD disc will be nothing more than a frisbee, ready to flip to the family dog.

PlexWriter 12/10/32A ensures a quality burn

Choose an efficient Plextor® drive, like the new PlexWriter™12/10/32A CD-rewritable E-IDE (ATAPI-4) drive, and you'll get blazing speed without creating useless CDs. Write at 12X, rewrite at 10X and read at 32X—faster than ever before.

Dramatically cut your present burn time without having to write-off bad discs as chew toys. The PlexWriter12/10/32A offers superior accuracy and reliability, easy operation, and what many can only talk about: BURN-Proof™—proven buffer underrun error protection that ensures exceptional performance and dependability, as well as providing increased productivity through multi-tasking.

Instead of flipping out, run in to your nearest Plextor dealer. For the address, call **800.886.3935**, or visit the Website at **www.plextor.com**.

Use only the best. Plextor CD-recordable media

Recognized for Reliability

PlexWriter 8/20 May 1999 — PlexWriter 8/20 February 1999 — PlexWriter 8/20 June 1999 — PlexWriter 8/20 February 1999 — PlexWriter 8/4/32 July 2000

PLEXTOR®

©2000 PLEXTOR, Corp. Plextor is a registered trademark and PlexWriter is a trademark of PLEXTOR, Corp. BURN-Proof is a trademark of SANYO Electric Co., LTD. All rights reserved. C330.9/MaxPC

for the blue-plate specials don't care about bus speeds. More cynical observers believe Intel is intent on making sure the Celeron doesn't steal the P-III's thunder.

The Fight

Since our two welterweight contenders can't be plugged into the same motherboard, it's impossible to completely isolate CPU performance during testing. But we did try to make the fight as even as possible. The 700MHz Duron was tested in an AMD reference system intended to represent the typical sub-$1,000 PC. As shipped, this system featured a Gigabyte 7ZM motherboard with VIA's KT133 chipset, 128MB of PC133 memory, and a pathetic TNT2 Vanta videocard. We chucked the Vanta in favor of Hercules' 3D Prophet II MX. Once our benchmarks were done, we moved the Hercules to our Cellie rig. To test our 700MHz Cellie, we built a box with an Intel 815E motherboard and 128MB of PC133 memory. We ran our usual gamut of benchmarks and included a few others to measure the processors' might.

Unlike past Intel-AMD bouts where we were intimately familiar with the processors on the fight card, we had trouble handicapping this event. Sure enough, the scores surprised us. The Duron led in most benchmarks, but not by much. In the Windows application test *SYSmark2000*, the scores were simply too close to call. The Duron edged the Celeron by just three points, which isn't enough to claim a decisive victory. In *Quake III*, the Duron again edged the Celeron—but by only 0.4fps. Again, too close to declare a winner.

In our MP3 encoding test, where we convert WAV files into 320Kbps MP3s, the CPUs took nearly the same amount of time. In our *Photoshop 5.5* action script, the Duron edged out the Celeron by just two seconds. Even in the CPU-dependent *Expendable* gaming test, the Duron beat the Celeron by only 2fps.

We finally saw the Duron pummel the Celeron in the *bootMark* test, scoring 218 points to the Cellie's 165. The *bootMark* is an integer performance test that relies heavily on cache size and speed. Here the Duron's slightly larger cache combo pays off handsomely. In the synthetic SiSoft *Sandra 2000* benchmark, the Duron was about three percent faster than the Celeron.

The Celeron only proved dominant in the *Inspire3D* benchmark. AMD has squawked about *Inspire's* floating-point problems in the past—saying the application ignores liberal opportunities to run floating-point operations in parallel—but we've actually seen the Athlon beat the P-III at certain frequencies. That didn't happen here.

DARE TO COMPARE: WELTERWEIGHT CPUs

MANUFACTURER	AMD DURON	INTEL CELERON "II"
L1 Cache	128KB	32KB
L2 Cache	64KB	128KB
Official bus speed	200MHz (100MHz double-pumped)	66MHz
Interface	Socket A	Socket 370
Slot adapters	Not available	May be used in Slot 1 motherboards with Socket 370-to-Slot 1 adapters that support Coppermine
Available speeds	700MHz, 650MHz, 600MHz	700MHz, 667MHz, 633MHz, 600MHz, 566MHz, 533MHz, 500MHz
Process	0.18-micron	0.18-micron
Current chipset support	KT133, AMD 750 (in Socket A), SIS 730	Intel 440LX, 440BX, 810 series, 815 series, VIA Apollo Pro 133A

BENCHMARKS	DURON	CELERON
Clock speed	700MHz	700MHz
Chipset	VIA KT133	Intel 815E
Memory	128MB PC133	128MB PC133
SYSmark 2000	**127**	124
bootMark	**218**	165
Quake III	**42.2fps**	41.8fps
MP3 encoding	**122 seconds**	123 seconds
Photoshop 5.5	**190 seconds**	192 seconds
3DMark 2000	**3726**	3629
CPU Mark (*3DMark* 2000)	**328**	283
SiSoft *Sandra* 2000	**1947 MIPS/973 MFLOPS**	1883 MIPS/935 MFLOPS
Expendable 640x480x16	**61.4fps**	59.4fps
Inspire3D	366 seconds	**339 seconds**

Dabbling in the Dark Art

All publicly available Athlons, Durons, P-IIIs, and Celerons are multiplier-locked, so if you want to become a dark art dilletante, eager to overclock without pulling out your CPU rewiring kit, you'll have to play with bus speeds. So just how fast can you push these suckers?

To conduct our own "warranty-voiding tests," we ditched the boring Intel 815 mobo in favor of the Soyo Sy-7VCA. We were able to cajole the 700MHz Celeron all the way to 872MHz without experiencing immediate stability problems. This entailed pushing the frontside bus from the stock 66MHz to 83MHz. Keep in mind that this nudged the PCI bus to 41MHz. Not every PCI card will run this fast, but we didn't experience any problems.

On the Athlon side, we weren't so lucky. Our attempts to push the 700MHz Duron much past its stock 100MHz system bus resulted in blue screens and total lock-ups. The best we could comfortably muster with our Duron machine was a pathetic 714MHz on a 102MHz bus. It looks like Intel is further along with its process than AMD.

The Decision

We declare AMD's Duron the performance winner, but only by an extremely slim margin. Though it triumphed in our synthetic benchmarks, it barely edged out the Celeron in our real-world tests. However, if you're into overclocking, you may want to put your money on Celeron. Intel has been churning out a 0.18-micron core longer than AMD has, so your chances for overclocking success are likely to be higher with Intel silicon. That may change, however, as the months grind on and clock speeds increase. ✹

The perfect mate really can make your life easier. And finding that special trackball is easy, with four choices guaranteed to fuel desire. Looking for a comfortable relationship? The Orbit® offers trackball space savings with the comfort of a mouse. A supportive partner? Our TurboBall™ offers total ergonomic support. Insist on beauty *and* brains? You'll go for the dazzling looks and high speed fingertip scrolling of the TurboRing™. The Expert Mouse® Pro does so many things, it's almost kinky. (Let's just say you won't find a more "advanced" trackball.) All are USB and PS/2 compatible. And all will have you working faster and more comfortably than ever. So what turns you on? To pounce on one of our trackballs, visit *www.trackballs.kensington.com*.

KENSINGTON®
Smart design at work.

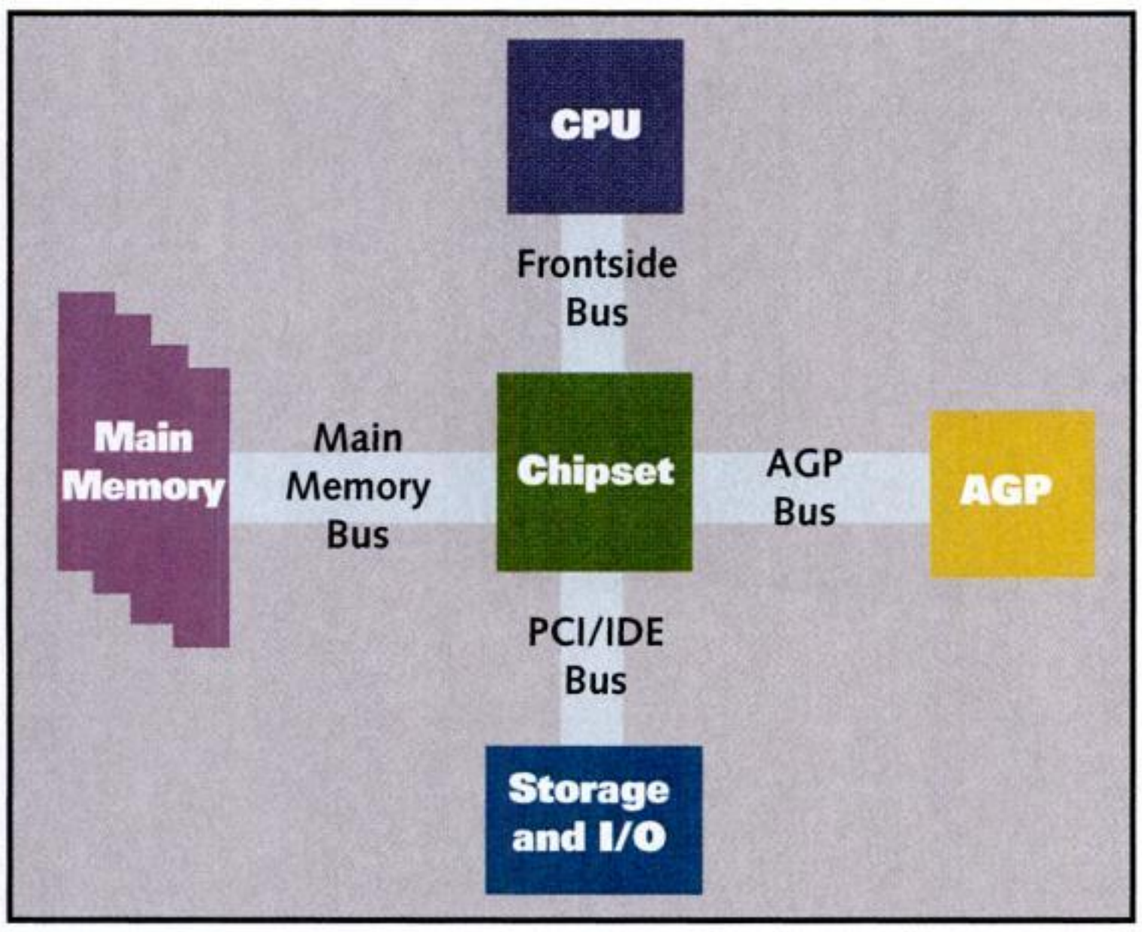
Kensington, Expert Mouse and Orbit are registered trademarks and TurboBall and TurboRing are trademarks of ACCO World Corporation. All other registered and unregistered trademarks are the property of their respective owners. ©2000 Kensington Technology Group, a division of ACCO Brands, Inc.

Copyrighted material

Multiproc Mania!

HOW DO MULTIPLE CPUs WORK IN CONCERT? WE GIVE YOU THE SKINNY ON SYMMETRIC MULTIPROCESSING.

Symmetric Multiprocessing (SMP) is a computing architecture that leverages the power of multiple CPUs to boost performance in individual computing tasks. SMP systems have been around for quite some time, but were typically confined to the high-end server and workstation space until very recently. In the x86 world, Abit's BP6 was the first mobo to bring SMP to the masses, but its adoption was primarily limited to the hardcore PC enthusiast market. Apple's recently announced SMP G4 systems truly mark SMP's entry into mainstream personal computing. When a company that's renown for pitching its products to a decidedly *non*-enthusiast audience starts shipping SMP systems as a standard configuration, it's a sign that SMP has finally become a significant force in the consumer arena.



Here's the basic single-CPU config. The chipset acts as the hub of the entire system. Traffic from different buses passes through the chipset and is routed to its destination.

ARE TWO BRAINS REALLY BETTER THAN ONE?

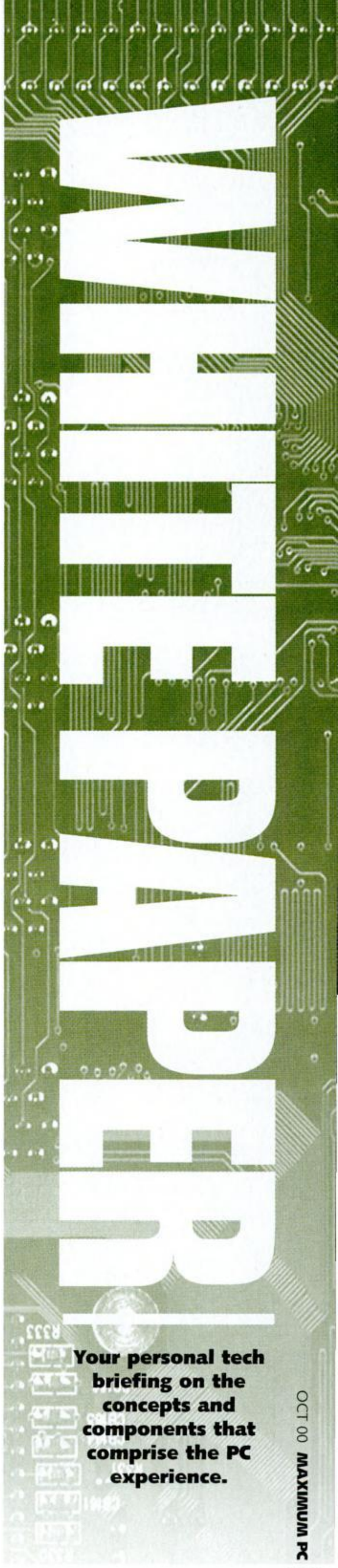
SMP systems come in a variety of flavors. All consumer-level SMP systems have two processors while higher-end SMP systems have four or more processors (these might be described as "four-way" or "eight-way"). The advantage of adding more processors to a PC might seem obvious at first. After all, when faced with a particularly intractable problem, throwing more resources at it is a time-honored American tradition.

So if one CPU is good, two must be twice as good, right? Well, it depends. Saying that adding a second CPU to a computer makes it twice as powerful is like saying that adding four-wheel drive to a Chevy Impala makes it twice as fast. A four-wheel drive Impala might be twice as fly as its two-wheel drive counterpart, but it would probably outrun the two-wheel drive only under very specific circumstances (towing a doublewide out of a trailer park in the dead of night, for example). And, of course, the exact details of how the four-wheel drive modification was made would also affect the car's performance. The same holds true when adding a second CPU to a PC. The actual performance increase depends on the way that the machine is being used, as well as the particulars of the machine's SMP implementation.

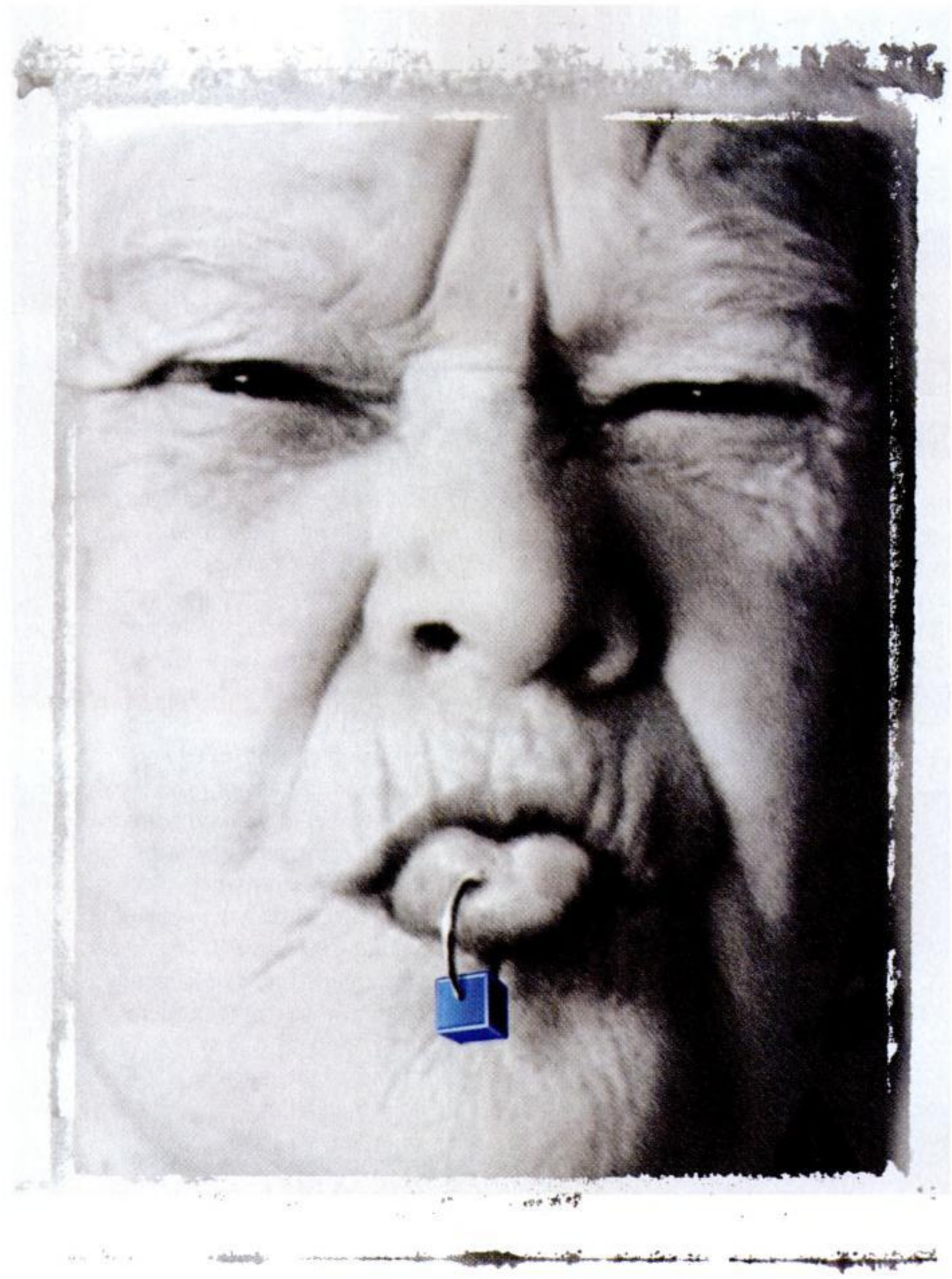
OS AND APPLICATION SUPPORT

Before SMP can be used to boost performance, an SMP machine's OS and applications must be specially outfitted to take advantage of more than one processor. A non-SMP-aware OS, such as MacOS 9 or Windows 98, will simply ignore the second processor. In contrast, an SMP-aware OS such as Windows NT or Linux can assign different processes to different CPUs, thereby distributing a user's application workload across the available hardware to optimize performance. For example, your web browser can run on one CPU while your word processor runs on the second CPU.

Furthermore, when individual applications contain multiple threads of execution, the OS can assign these threads to different CPUs so that a single application can straddle multiple processors. For a highly multithreaded application such as Adobe *Photoshop*, the ability to divide work among multiple CPUs can seriously boost performance.



Copyrighted material



RADICAL 3

Legendary Graphics Power
for the Linux Desktop™

www.corel.com

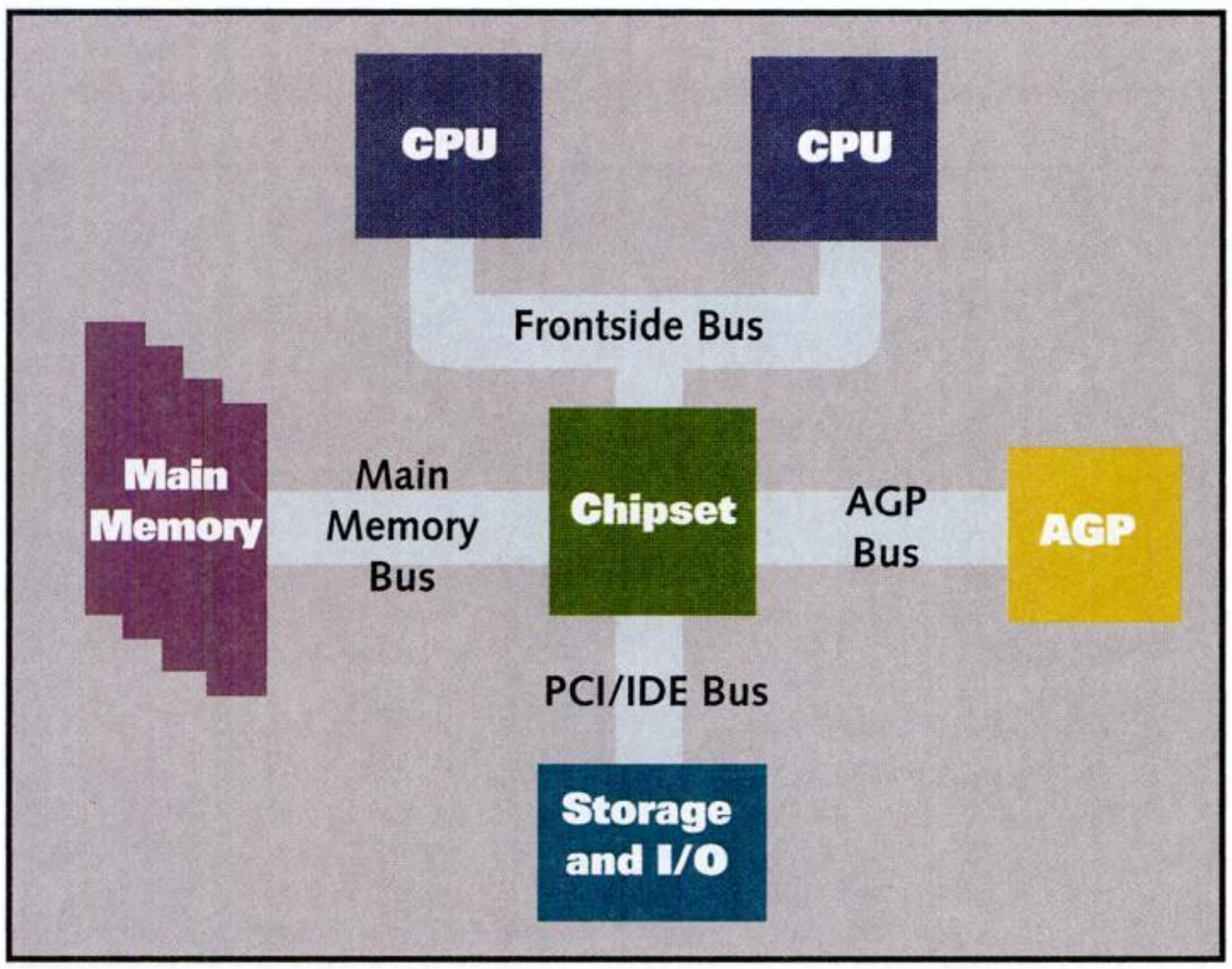
Graphics Suite
CorelDRAW® for LINUX®

Copyright © 2000 Corel Corporation. All rights reserved. CorelDRAW and the "Legendary Graphics Power for the Linux Desktop" byline are trademarks or registered trademarks of Corel Corporation. Linux is a registered trademark of Linus Torvalds.

Copyrighted material

Applications must be engineered for SMP from the ground up if they're to fully exploit its potential. Some applications—especially data-intensive apps that process large media files—can be easily broken up into multiple threads of execution. Each thread is basically a tiny subprogram that can work in parallel with other threads to quickly process a large media file. Non-data-intensive applications—such as office and productivity apps—don't benefit as much from SMP because they can't usefully be broken up into multiple threads.

It should be noted that in the case of MacOS 9, specific applications, such as *Photoshop*, can be SMP-aware even though the OS itself is not. Therefore, Macintosh users who choose to buy one of the new SMP G4s now will see benefits only when running a few specific applications. It won't be until OS X appears that Mac users will be able to take advantage of both processors under everyday circumstances.



In a shared-bus SMP system, multiple processors share the same frontside bus. Only one processor at a time can use the shared-bus to talk to the chipset and, through it, to the rest of the system.

SHARING AND COMMUNICATION

Getting multiple CPUs to efficiently communicate both with each other and the rest of the system is one of the most basic problems that an SMP design must resolve. In a single-processor system, the CPU is connected to the core logic chipset via the frontside bus (FSB). The chipset, in addition to being connected to the CPU's FSB, is also connected to the main memory bus, the PCI/IDE bus, the AGP bus, and various other buses that contain I/O devices. The chipset acts as a central hub to which all of these buses and their attendant devices are connected. So, if a device on one of these buses needs to talk to a device on another bus (for example, if the CPU needs to talk to main memory or the AGP card) then that device has to communicate through the chipset.

There are two ways to add multiple CPUs to a PC like the one described above. The first way is to place the CPUs on a single, shared frontside bus. Such a system boasts what's known as a shared-bus topology. Shared-bus topologies are used by all Intel-based x86 machines and by Apple's new SMP G4s.

In spite of such widespread use, the shared-bus topology has some distinct disadvantages. One problem is *bus arbitration*—which CPU gets access to the bus, at what time, and for how long. Because each processor must use the same bus in order to talk to the rest of the system, and because only one processor can use that bus at a time, the demand for FSB attention can be high. All processors have to coordinate with each other for use of the bus, and they have to wait for the bus to become available before they can use it. Imagine a home with multiple teenagers and one phone line and you'll get an idea of just how profound a bottleneck a shared bus can be for a few busy processors.

Another problem with using a shared bus is that each processor represents an electrical load on the bus. The more processors you add to a shared bus, the more interference you get in the form of electrical ringing, and the harder it gets to make sure that each CPU's signals are coming through the bus clearly. The GTL+ bus (which is used by all of Intel's x86 chips) can handle no more than four processors on a single shared bus. This limitation greatly restricts the scalability of Intel SMP systems and makes adding more than four processors a challenge.

So how do we overcome the problems associated with a shared-bus topology? The solution is to give each processor its own dedicated frontside bus that connects directly to the core logic chipset. Such a configuration is called a point-to-point topology, and this is how the Athlon's EV6 bus is configured. This bus topology is called "point-to-point" because each CPU can establish its own private connection with any other device in the system without having to concern itself with what the other CPUs are up to at the moment. The chipset, acting as router or switchboard, assumes the burden of establishing and maintaining a point-to-point connection between an individual processor and the system resource that the processor is using. This way, the processor thinks that it has a private line to that resource as if it were the only processor in the system.

To return to the telephone analogy, this would be like installing separate phone lines in our multi-teenager home. To dial out, someone just picks up the phone and calls a number without being concerned about other phones in the house that may be in use. The phone company's switchboard connects each call's point of origin with its destination point, and maintains that connection independently of the other traffic on the phone network.

CACHE COHERENCE

The next challenge that an SMP system faces is coordinating the different processors' reads and writes to main memory while simultaneously keeping each processor's individual caches in sync. In tightly coupled SMP systems, all of the proces-

Copyrighted material

sors petition one large pool of shared system memory. This is a bit like allowing multiple users on a network the ability to simultaneously open and edit the same *Word* document. What if two people open the same document and start editing it simultaneously? What if one of them hits "Save" and overwrites the other's changes? What if one opens the document right before the other saves some important changes to it and begins working with an out-of-date copy?

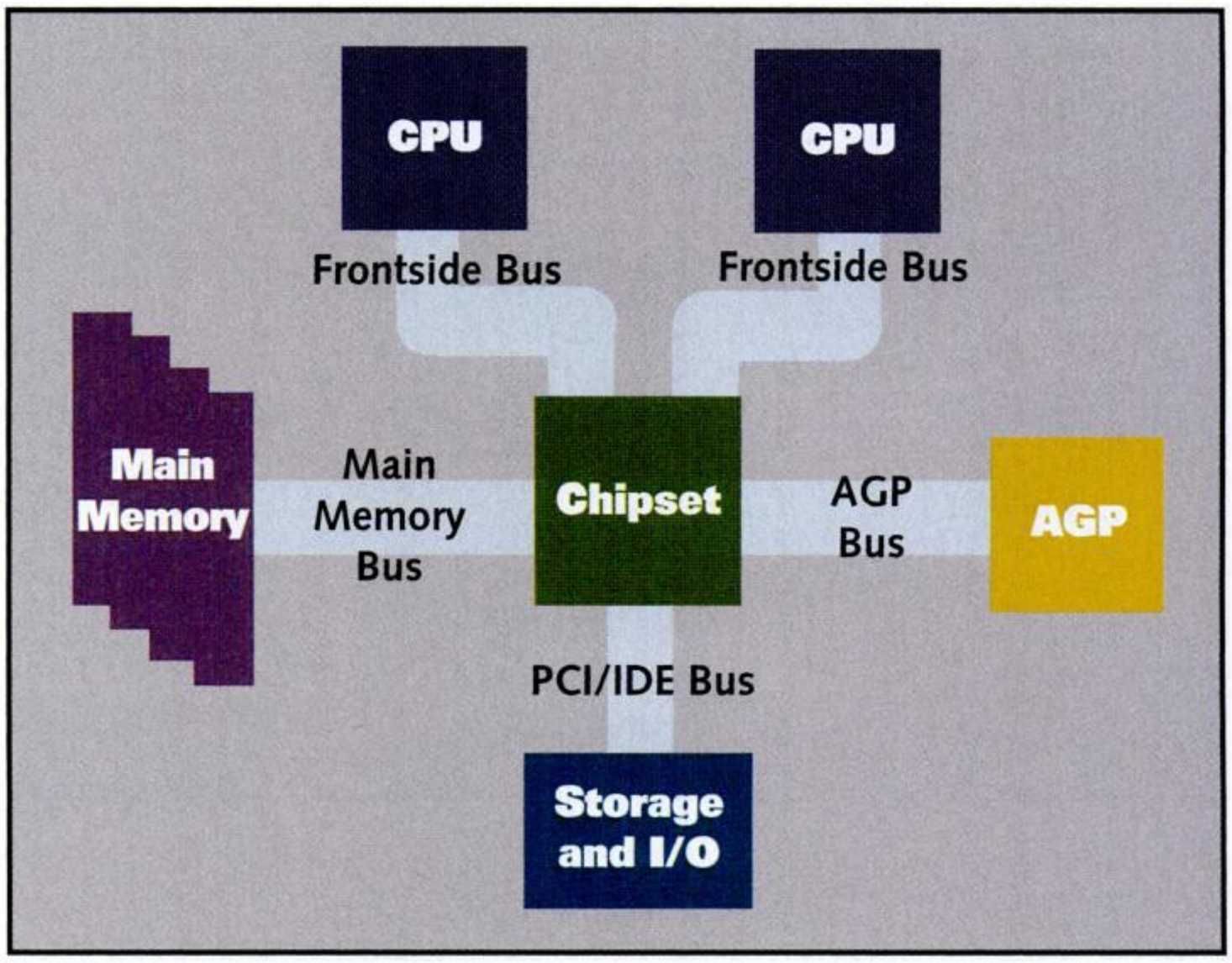
The problem of coordinating reads and writes to shared main memory is exacerbated by the fact that each CPU replicates parts of main memory in its local L1 and L2 caches—caches that none of the other CPUs in the system have direct access to. To extend the *Word* document analogy, this would be like multiple people on a network saving a local copy of the same document, editing that copy, and then moving it back out to the file server when they're done. Unless those people are somehow in constant communication, chaos is inevitable.

The processors in an SMP system must likewise keep in constant communication. All of the changes among the locally cached copies of parts of RAM and the shared RAM pool must be coordinated among the processors; each CPU not only has to keep the others constantly informed of what changes it's making to memory, but it also has to know what's in the other processors' caches so that it can be sure that it's working with the latest data.

The task of keeping every CPU's local cached data in sync with that of every other CPU is called "cache coherence." There are a couple of ways to tackle this. The most common approach is to have each processor's cache listen in (or "snoop") on every other processor's data requests to determine if any other processor is requesting a block of data that it itself currently holds a copy of. By keeping constant tabs on the sharing status of every block of physical memory that it is caching, a CPU's cache can coordinate access to the blocks with other processors, thereby ensuring that everyone sharing the data has access to the most up-to-date version. Imagine that the users on our hypothetical file-sharing network are required to yell out the name of a document to everyone else in the office before opening it or saving it. This way, if a conflict were to arise, the users whom it affects would be alerted and could resolve the problem among themselves.

While snooping offers a workable, low-cost solution for a tightly-coupled SMP system, it also presents drawbacks. On a shared-bus Intel system, all of this snooping takes place on the same frontside bus that the processors use to communicate to the chipset. This added "snoop traffic" ties up valuable bus bandwidth, which the processors use for other things (in the same way that people constantly yelling out file names in an office would distract everyone from working). The Athlon's EV6 bus uses a dedicated snoop bus to handle snoop traffic, so the caches can take care of their business without getting in anyone's way.

The G4's MPX bus (also called "Maxbus") uses a trick called data intervention to speed up its cache coordination efforts. To understand how this trick works, consider two processors, **A** and **B**. Processor **A**'s cache detects that processor **B**'s cache wants to read data from a block of main memory that processor **A** is caching and has just recently modified. In a system *without* data intervention, **A** would halt **B**'s read request so that it could first write the updated data out to main memory. **B** would then restart its read request once **A**'s write was finished. In a system *with* data intervention, **A** just tells **B**, "Hey, wait. I've got the latest copy of your data right here. Don't bother with main memory, because I can just send it to you directly." So data intervention lets processor **A** send the modified data directly to processor **B**, bypassing main memory entirely.



In a point-to-point SMP system, each processor has its own dedicated bus to the chipset. This means that the chipset can establish a point-to-point connection between an individual processor and a shared resource, so that that processor doesn't have to be aware of the other processors' resource usage.

THE FUTURE

As multiprocessor machines become even more widespread in the mainstream computing market, look for more consumer-level operating systems and applications to be outfitted to take advantage of them. Apple's upcoming OS X, with its BSD UNIX core, will be fully SMP-aware, and it's not unreasonable to speculate that Microsoft will soon follow suit with an SMP-aware, consumer-level version of Windows. And with SMP increasingly being viewed as a relatively inexpensive way to add more power to a system, consumer-level SMP hardware will get better, too. In fact, it's only a matter of time before companies such as IBM begin integrating multiple CPUs onto a single processor die to create MPSOC (multiprocessor system on a chip) implementations that pack even more processing power per dollar into tomorrow's desktop machines.

—Jon Stokes

Jon Stokes is one of the founding members of the Ars Technica web site (**www.arstechnica.com**).

Copyrighted material

Total PC surge protection for only $5 per outlet.

At $40, APC's SurgeStation™ protects up to 8 devices from damaging surges and spikes, for life.

Lightning storms, overloaded circuits, electrical surges can destroy computers, TVs, sound systems, and VCRs in a flash, whether they are on or not. This is especially true during summer months. An APC SurgeArrest® is your ironclad guarantee that valuable electronic components stay alive, regardless of bad weather or other unexpected power problems.

In fact, if you experience a high voltage power surge, an APC unit will sacrifice its life for your equipment. Our Lifetime Guarantee means you'll receive a brand new replacement SurgeArrest, free of charge, usually within 48 hours. So your expensive electronics survive unharmed and you receive a brand new APC to boot!

Join 8,000,000 customers who already rely on APC power protection today.

APC SurgeArrest® SurgeStation™ Pro8T2: complete surge protection for your entire system.

APC was chosen by PC Magazine as one of the "Top 100 Technology Companies That Are Changing The World" (10/99).

A SurgeArrest SurgeStation gives you:

- Eight (8) outlets to protect your computer, displays, printers, scanners and more (3 spaced outlets for transformer blocks)
- Telephone/Internet protection* safeguards from telephone line surges
- Green "Protection Working" LED lets you know that your SurgeArrest works perfectly
- Red "Site Wiring Fault" LED automatically detects potentially dangerous wiring problems in the wall circuit
- Cable/TV/Video protection* safeguards from cable modem line surges
- Up to $25,000 in Equipment Protection Policy (U.S. and Canada only). *(See policy for details)*
- APC will replace your SurgeArrest free of charge under its Lifetime Product Guarantee

** select models*

Notebook Surge Protection for only $59

The PNotePro family protects your notebook from power and telephone surges anywhere in the world.

PC Power Protection for only $79

The Back-UPS® Office provides your PC with surge protection and battery back-up to save your work and shut down properly.

Workstation Power Protection for only $149

The Back-UPS Pro® USB provides advanced power protection, AVR for extended runtime, and is compatible with Windows® 98.

APC®
Legendary Reliability™

You can find APC power protection products at these stores or visit *http://promo.apcc.com* and click on "how to buy" to find your nearest reseller.

energyOn.com™ The World's Online Energy Store™ · CIRCUIT CITY · PC Connection 800-986-2320 · UPbuyTIME.com · STAPLES The Office Superstore

Official Power Protection of

USA Cycling

APCC™ A Nasdaq-100 Company

FREE APC T-shirt for the first 100 entrants. One lucky winner will receive a FREE APC UPS.

To order: Visit *http://promo.apcc.com* Key Code v143z • Call 888-289-APCC x8751 • Fax 401-788-2797

©2000 American Power Conversion. All Trademarks are the property of their owners. APC4AØCF-US • PowerFax: (800) 347-FAXX • E-mail: apcinfo@apcc.com • 132 Fairgrounds Road, West Kingston, RI 02892 USA

Copyrighted material

Join Your Distinguished Colleagues.

Linux Professional Institute Certified

Linux is taking the industry by storm! Some of your peers are already making the grade with Linux Certification. LPIC creates the opportunity to increase your income potential, as well as offering greater career options. **Join Your Colleagues Today and Get Certified!**

At CyberStateU.com You Get:

- **Linux Official Curriculum**
- **Personalized Web-Based Lessons**
- **Over 90% First Time Pass Rate**
- **Live Network Practice Labs**
- **To Learn Anytime, Anywhere**
- **A Virtual Linux Community**

CyberStateU.com Online Certification For:

NEW! **Linux**

Microsoft®

NEW! • Windows® NT 4.0 to Windows 2000 Update
• MCSE™ for NT 4.0
• MCP™ + I • Visual Basic™ Development

Novell®
• CNE™ 5 • CNE 4.II to 5 Update • CNA™ 5

CompTIA™ A+

Computer Telephony Engineer℠

CCNA®

CompTIA · Computer Technology Institute · The Linux Professional Institute · Microsoft Certified Technical Education Center · Novell Online Training Provider

1-888-GET-EDUCated 1-925-299-2000

CyberStateU.com

Copyrighted material

Symptom | Diagnosis | Cure

It always starts innocently enough—you want to update your video drivers, for instance. Next thing you know, you smell smoke, your PC won't boot, and that sinking feeling overtakes your gut. Doh! Don't panic—The Doctor is here to help. If you're experiencing a PC meltdown, send a note to doctor@maximumpc.com. We can't help everyone, however. Please consult the *Maximum PC* forums or vendor tech support if you need assistance ASAP.

Bogged Down Bootup

I have tried everything from clearing my Registry to clearing my Startup folder, but I can't seem to reduce the time it takes me to boot. It's really bad. It takes me about four to five minutes to boot my system now. I have a Celeron 366, 128MB of memory, a 45GB hard drive, and plenty of peripherals. Could you please tell me how I can reduce boot times.

—David Gautraud

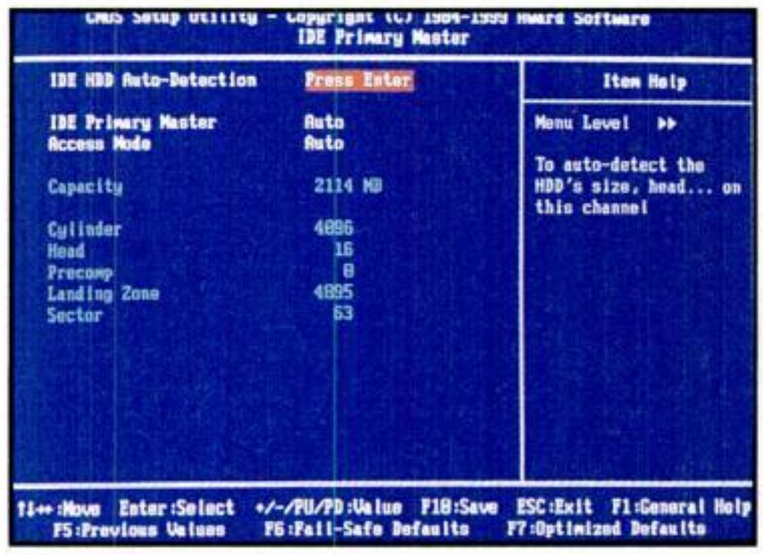
There are a few places that you can check for flotsam that might be hindering your bootup. Commands to start programs at boot time reside in three places: DOS startup files, the Registry, and the Startup folder. And you may not even have a Windows problem; some hardware is notorious for prolonging the bootup process.

You stated that you've already cleaned your Registry and Startup folder, so try checking the old DOS startup files, config.sys and autoexec.bat, which reside at the root of your C: drive. You'll want to open these files in Notepad and deactivate any line of code that launches an unnecessary program. Because actually removing the wrong line can cause your system to behave erratically (or not boot at all), you should instead "comment out" the offending lines by putting the term REM (in autoexec.bat) or a semi-colon (in config.sys) in front of the line. For example, in autoexec.bat, a temporarily disabled line would look like this:

REM LH C:\WINDOWS\AU30DOS.COM

The Doctor recommends commenting out one line at a time in order to minimize the risk of damaging your system. Windows ME users need not concern themselves with autoexec.bat and config.sys, as ME has dropped these DOS vestiges.

If your system still takes longer than a minute or two to boot, you may be experiencing a hardware initialization problem. SCSI cards, Ultra DMA controllers, RAID cards, and some soundcards take a long time to initialize. If a large portion of your boot time is spent before the Windows screen pops up, you're probably suffering the effects of hardware that's slow to initialize. If you have IDE drives, you can shave a few seconds off your boot time by pre-detecting the drives in the BIOS, rather than forcing your PC to detect them each time you restart. Look for IDE Drive Auto-Configuration in your motherboard manual for more details.



Pre-detecting IDE drives can shave precious seconds off your boot time.

CPU Retention

I recently upgraded an ASUS P2B-S motherboard from a Pentium II 350 to a Pentium III 600. I was not aware that the retention mechanism for the Pentium II would not fit the Pentium III, so my computer now lies on its side so the processor won't fall out.

I have scanned the web looking for retention mechanisms and sent ASUS e-mails with no success. I recently attended a computer show, and all I received was a lot of dumb stares. The Pentium II mechanism screws into the motherboard with four brass screws. In addition, the board has two plastic posts that hold two plastic "C" clips. While I know it's unnecessary, I used both systems to attach my Pentium II (belt and suspenders, if you will). I would appreciate any help you can give me in locating a Pentium III retention mechanism for my ASUS P2B-S. Please help. The footprint of my full tower lying on its side is taking up my whole desk!

—Mike Connor

You really don't need those silly retention mechanisms unless you're moving your PC around frequently. In fact, the original Pentium II

> **"Some hardware is notorious for prolonging the bootup process."**

Copyrighted material

WHACK!

this is the sound of your hand
hitting your head after you find out
you could have designed your web
pages faster, easier, and cheaper
if you had been to **Ulead.com** first

Announcing new PhotoImpact 6! Use it to "Show Us Your Site" and win $5,000! Download it for free at www.ulead.com

PC WORLD BEST BUY

Ulead Systems

BETTER TOOLS FOR BETTER WEBSITES

©1992-2000 Ulead Systems, Inc. All Rights Reserved. Ulead is a registered trademark and the Ulead Systems logo is a trademark of Ulead Systems which may be registered in certain jurisdictions. All other trademarks are the property of their respective owners.

Copyrighted material

systems didn't even have a retention mechanism. And the brackets don't always help; the Doctor has seen situations in which the processors popped despite being strapped down by the fancy contraptions.

Nonetheless...the part you're looking for is a Molex 67210-0006 Universal Retention Mechanism. The major problem will be finding a dealer who carries the part and is willing to ship it to you. A list of dealers is available at **molex.com/ contact/usadisty.html**. If you contact Molex, the company may be willing to send you a sample unit. If you can't get a retention unit, don't sweat it—just leave the processor unsecured. You'll know it's come loose if your PC fails to boot and doesn't issue any error beeps.

Slocket Uncertainty

I'm looking into upgrading my processor from a Celeron to a Pentium III, but I'm a little uncertain as to what my options are. I'm using an Abit BE-II Slot 1 motherboard with a 433MHz Celeron that's plugged into a "slocket," i.e., a card that accepts the P-PGA Celeron and, in turn, plugs into the Slot 1 connector of the motherboard.

I want to upgrade to a 700MHz Pentium III, but I'm having trouble locating one in a Slot 1 configuration. The computer store I frequent does have the P-III 700, but only in P-PGA configuration. Unfortunately, the technical knowledge of the salesperson is lacking, so he couldn't tell me with certainty whether I could use this with my current setup. Would you happen to know if the P-PGA Celeron and the P-PGA P-III have the same pinout configuration? In other words, will I be able to unplug my Celeron from my P-PGA-to-Slot 1 adapter card and replace it with a P-PGA Pentium III?

—Vincent Alvarez

FC-PGA (or Flip Chip-PGA) Pentium IIIs aren't 100-percent pin-compatible with older Plastic PGA Celerons. To get a new FC-PGA to work in your BE-II, you'll need a newer adapter, such as Iwill's Slocket II (**www.iwill.com**), to make it work properly. The main difference between the FC-PGA and the P-PGA is that Intel inverted the core to make it easier to cool. Keep in mind that you're going to need a P-III operating on the 100MHz bus, so make sure you buy a Pentium III 700E, not a 700EB, which means it's a Coppermine processor running on a 133MHz frontside bus.

"For some reason, all of my PCI devices are on IRQ 9. How can I move these devices to other IRQs?"

Win2000 Weirdness

My problem—well, not really a problem, but rather a concern—is that, for some reason, all of my PCI devices are on IRQ 9. How can I move these devices to other IRQs? I've tried reformatting the computer, starting from scratch, adding one device at a time, manually assigning the IRQs in the BIOS, and even moving the two PCI cards to different slots—pretty much everything I can think of, but to

Device Manager
Action View
Interrupt request (IRQ)
(ISA) 0 System timer
(ISA) 1 Standard 101/102-Key or Microsoft Natural PS/2 Keyboard
(ISA) 3 Communications Port (COM2)
(ISA) 4 SMC IrCC - Fast Infrared Port
(ISA) 6 Standard floppy disk controller
(ISA) 8 System CMOS/real time clock
(ISA) 9 Microsoft ACPI-Compliant System
(ISA) 9 MPU-401 Compatible MIDI Device
(ISA) 12 PS/2 Compatible Mouse
(ISA) 13 Numeric data processor
(ISA) 14 Primary IDE Channel
(ISA) 15 Secondary IDE Channel
(PCI) 9 ATI Technologies Inc. RAGE P/M Mobility AGP 2X
(PCI) 9 ESS Maestro2E PCI AudioDrive (WDM)
(PCI) 9 FE575C-3COM 10/100 LAN CardBus-Fast Ethernet
(PCI) 9 Intel 82371AB/EB PCI to USB Universal Host Controller
(PCI) 9 LT Win Modem
(PCI) 9 Texas Instruments PCI-1225 CardBus Controller
(PCI) 9 Texas Instruments PCI-1225 CardBus Controller

The first time you open Device Manager in Windows 2000 can be quite shocking, if you don't know what to expect.

no avail. The reason why I say it's not a problem but more of a concern is that I understand that Win2000 is a much better handler of IRQs, not to mention the fact that I haven't experienced any crashes or lock-ups. Still, given that there are other IRQs available, I would feel more comfortable if they were being used. Will I have to resort to putting Wintendo 98 on my machine? Please say it isn't so and that there's a way to use all my IRQs.

—John Keefer

The good news is that Windows 2000 is functioning correctly. Windows is simply taking advantage of the ACPI features of your motherboard and assigning IRQ 9. Because PCI 2.1-compliant cards have to be able to share an IRQ, this shouldn't cause problems unless your motherboard's ACPI implementation isn't up to spec.

If you really, really, really want each of your devices to have a distinct IRQ, all you have to do is disable ACPI in your system's BIOS, then reinstall Windows 2000. But unless you're having problems, the Doctor thinks this is a bad idea. One of the Doc's favorite aphorisms applies here: "If it ain't broke, don't fix it."

Drive Letter Dilemma

I recently acquired a second hard drive for my computer. Both are Quantum Fireball 2.4GB 5,400rpm drives. I have an Abit BX-6 R2 motherboard with the Award BIOS. I have my original hard drive set as the Primary Master and the new hard drive set as the Secondary Master with a Memorex 36x CD-ROM as the Secondary Slave.

I know all the connections are correct because the boot screen shows detection of both hard drives and the CD-ROM in the correct configuration. When I first booted Windows with the new hard drive, it detected the drive and loaded the appropriate drivers but never assigned a drive letter. I am unable to assign my own drive letter in the system settings and I don't know what to do. Please help.

—Ray Bieze

Ah, yes, the old drive letter bugaboo. In order for Windows to assign a letter to the hard drive, the drive must be formatted. To do so within Win98, open up the My Computer icon on the desktop. Now, right-click on the drive without the letter and choose "Format." Windows will then proceed to format your drive. Make sure you format the correct drive, as this will kill all information on the drive being formatted. To get the most storage out of that drive, you will want to format it using FAT32, because FAT16 will read up to 2GB and no more. When done, Windows will be able to use the available drive space and, upon the next reboot, a letter will be assigned to that drive. And with that, the Doctor beats a hasty retreat...

Copyrighted material

REVIEWS

Poking Inside the Engine

In the main, *Maximum PC* game reviews have focused on the "fun factor": game play, plot, replay value, and so on. The problem is, every other magazine and web site takes this very approach and, as a result, our game reviews have offered nothing unique to the discriminating hardware junkie.

To give you a fresh perspective, this month we applied a different strategy in one of our game reviews. On page 84, in our *Heavy Metal: F.A.K.K.2.* review, we critique not game play, but the game's underlying technology. Does the engine challenge the latest generation of hardware? How outrageous are the game's models and rendering tricks? The answers determine whether the game scores a low verdict or a Kick Ass Award.

If you want to know how *F.A.K.K.2.* installs, the details of its story, or how many hours of glee you can expect from it, pick up an issue of our sister publication *PC Gamer*. And please let us know if you like the new approach by e-mailing Jon at editor@maximumpc.com. If you vote for deeper technology critiques, we might expand this type of coverage.

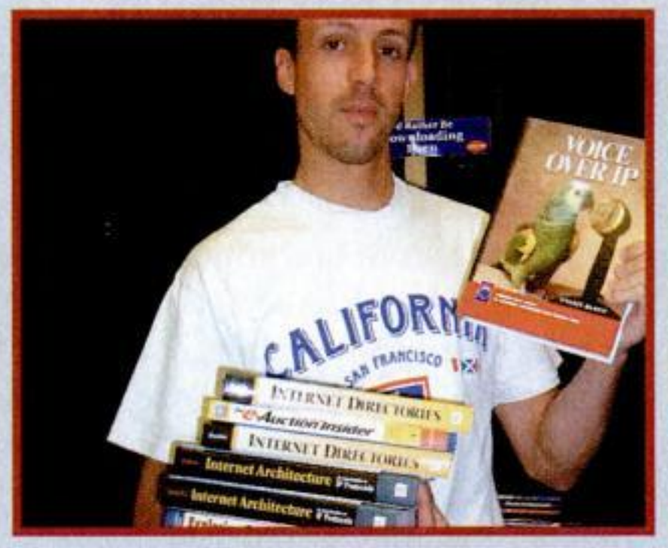
In other news, we recently hired two new staffers to boost the magazine's technology quotient. Please welcome Technical Editor Will Smith and Associate Technical Editor Scott Tarr. Don your geek helmets and check out their reviews of the ATI Radeon and PC133-based mobos on pages 72 and 70, respectively.

—JOSH NOREM, REVIEWS EDITOR

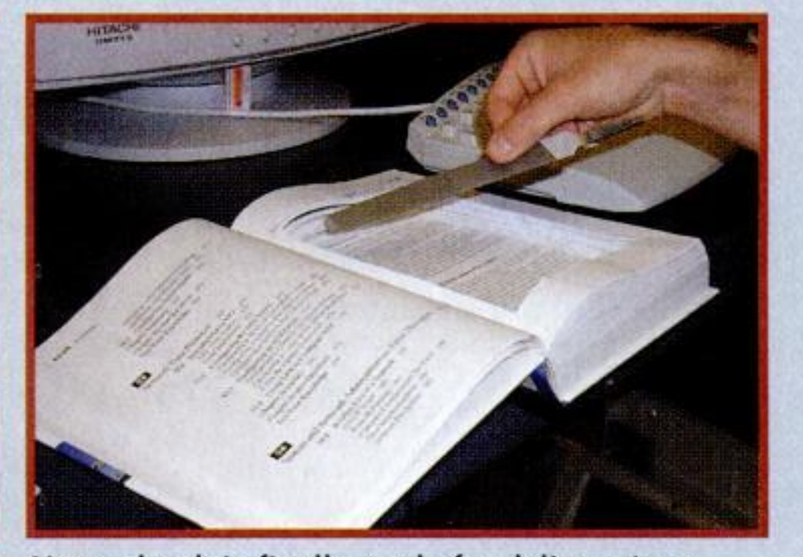
'Books to Prisons' Program Takes Flight

Last month, we described how we've been sending unwanted IT books to prisoners looking to score technology jobs upon release. Since that time, we've been besieged with letters from various "joints" around the country, all of which are apparently housing rabid IT enthusiasts. We don't understand why these books are so popular, but we decided to institute a "Books to Prisons" program to meet the demand.

Here's a letter from one of our imprisoned technology enthusiasts. It seems a shortage of IT material in the pen leaves their thirst for arcane networking knowledge unquenched. That's where we come in.



Josh prepares IT books for shipment to the Big House. It's time-consuming but worthwhile, especially since we know that the books are serving a good cause.

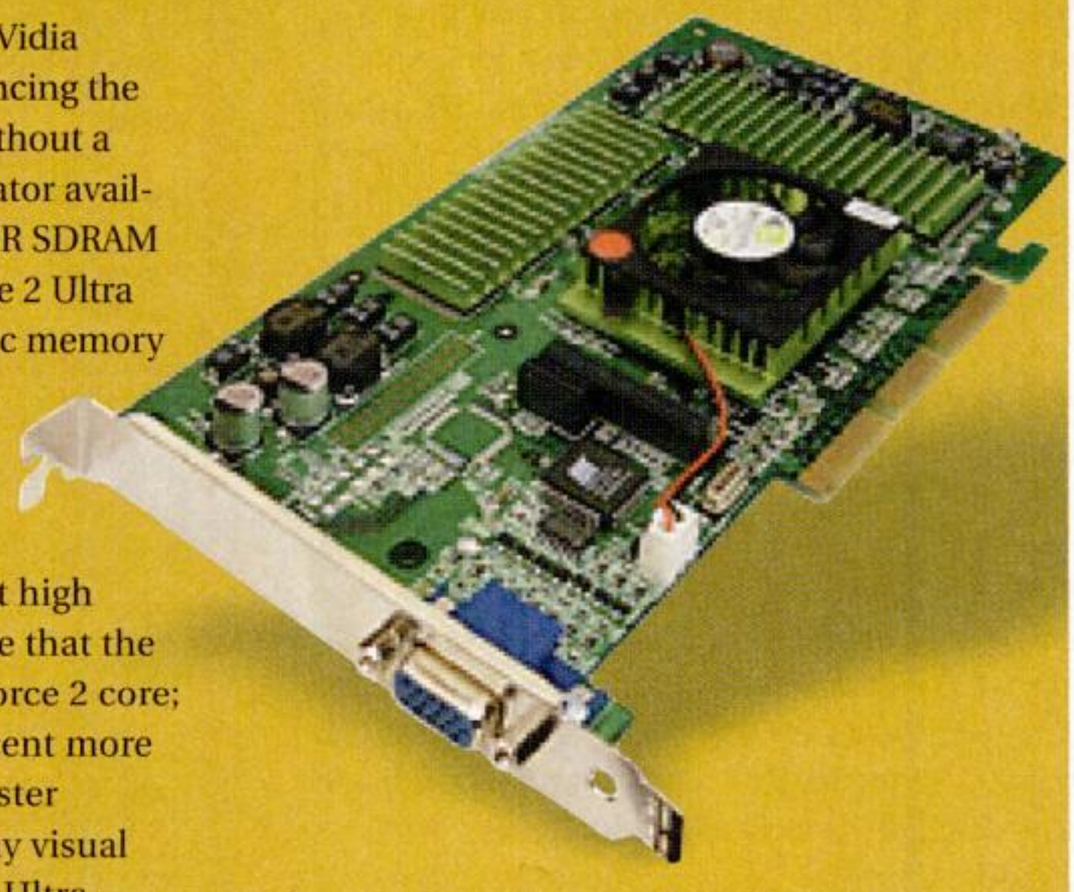


Here a book is finally ready for delivery to a lucky convict. Technology is liberating, to say the least.

Copyrighted material

A behind-the-scenes look at the Maximum PC Lab and the gearheads who work in it.

THIS JUST IN: NVIDIA SUPER-CHARGES GEFORCE 2



Right before we went to press, nVidia dropped a bombshell by announcing the new GeForce 2 Ultra chipset. Without a doubt, it's the fastest 3D accelerator available. By combining 230MHz DDR SDRAM with a 250MHz core, the GeForce 2 Ultra boasts an astounding 7.36GB/sec memory bandwidth, clearing the famous memory bottlenecks that the GeForce 2 suffered.

The GeForce 2 Ultra does indeed offer incredible speed at high resolutions, but please be aware that the chipset still uses the basic GeForce 2 core; now it's just clocked for 25 percent more performance and married to faster memory. Don't expect to see any visual quality improvements with the Ultra.

Expect to see Creative offering an Ultra sometime in September, with Hercules following in October. The GeForce 2 Ultra will only be available in 64MB versions. Although the chip will support up to 128MB of RAM, we don't anticipate seeing those configs until memory prices drop and games that actually use more than 64MB of textures become available.

So what does all this performance give you in the real world? We got an astounding 91fps in *Quake III* demo001 at 1024x768x32, with all detail settings cranked up on our test systems. We ran demo001 at 1280x1024 for kicks and got about 60fps.

Does the GeForce 2 Ultra bring anything to the table that warrants a $500 price tag? Stay tuned for full reviews of GeForce 2 Ultra cards from Creative and Hercules in an upcoming issue.

Lemon of the Month

Idrather.com Bumper Sticker

To whoever sent this, we'll have you know that we have *never* surfed for adult entertainment on the Internet. OK, maybe just once to test the porn-blocking software *EyeGuard*—but that was official company business. Frankly, we'd much prefer the "I'd rather be receiving gift baskets of fine cheeses and summer sausages" bumper sticker or, better yet, the gift baskets themselves.

CHECK IT OUT Online

www.maximumpc.com

Benchmarking: Full Disclosure

Visit **www.maximumpc.com/benchmarking** for the complete lowdown on *Maximum PC*'s benchmarking strategies.

31 PRODUCTS REVIEWED!

Hardware

- Ericsson R280LX phone .36
- Motorola Timeport 8167 36
- Motorola i1000plus . . . 37
- OmniSky Minstrel V modem 38
- Palm VII PDA 38
- RIM Blackberry 957 . . .39
- Motorola Talkabout T900 39
- ORiNOCO RG-1000 Residential Gateway starter kit 40
- CableFree NetBlaster . . .40
- Promise FastTrack 100 RAID controller 47
- AMI Hyperdisk RAiD controller 47
- Axis Terra AXA system .68
- Intel 815EEA mobo 70
- Soyo SY-7VCA mobo . . .70
- ATI Radeon 72
- Sony FW-900 monitor .74
- Sony SDM-N5PS monitor 74
- VideoLogic DigiTheatre .75
- S4 Midiland 8200 75
- Digital Audio Labs CardDeluxe 76
- Gadget Labs Wave/496 76
- Waveterminal U2A USB audio connector 76
- Hewlett-Packard Laserjet 3150 printer . . .78
- Samsung MSYS 5100P Laserjet printer 78
- Seagate Cheetah X15 . .80
- Quantum Atlas 10K II . .80

Games

- Heavy Metal: F.A.K.K.2 .84
- KISS Psycho Circus: The Nightmare Child 85
- Icewind Dale 86

Applications

- Windows Millennium . .82
- 1Safe Backup 83

seemebuyme.com

Want direct links to vendor info and verified online retailers? When you see this icon in product reviews, simply go to the accompanying URL, or call the toll-free number, and SeeMeBuyMe will connect you to the product in a flash.

SeeMeBuyMe™

Hardware photography by **AARON LAUER**

Copyrighted material

Axis Terra AXA

THIS THUNDERBIRD BOX ROCKS

The Axis 1GHz T-Bird looks vanilla, but inside it's a mouthful of creamy computing nougat.

The last rig we tested from Axis Systems was like a prom queen with bad B.O. It looked great and was stacked—with killer components—but its benchmark performance left a stench in the air. Even worse, the system was plagued by blue screens, forcing us to question the company's QA efforts. With its latest 1GHz Thunderbird offering, Axis redeems itself in the stability department, and while the system's performance isn't record breaking, it's on target given the system's configuration.

Like last month's Polywell Thunderbird system, the Axis Terra AXA model (**www.axissys.com**) boasts other components we commonly refer to as "the usual suspects"—a GeForce 2 GTS graphics card, a SoundBlaster Live! Platinum soundcard, a 19-inch monitor, yadda, yadda, yadda.

Performance in every benchmark category was on par with our expectations, but slightly lower than the 1GHz T-bird Polywell system tested last month. While the Polywell reaps the benefits of its ATA/100 RAID array (see this month's feature on IDE RAID), its hardware configuration is otherwise identical to the Axis system. Still, the Polywell performs a notch faster across the board—and it costs $300 more than the Axis system.

When we busted open the Axis to check out its innards, we noticed that everything was bundled up nice and tidy-like. In fact, we'll go out on a limb and say this is the nicest system wiring we've seen in a long time. The excess IDE cabling used on the primary channel is tucked back behind the drive gondola and secured to the case's inner wall with plastic ties. In fact, it's a shame that such a beautiful interior is covered by such a plain outer shell. The case is as plain as a Dell case, but at least a Dell case grants you access with just a twist of a single thumbscrew. Axis requires you to remove the entire case by unthreading four screws on the back, which is a pain for frequent upgraders and parts-swappers.

Although the custom-painted Polywell system looks cooler and performs better than the vanilla Axis rig, if forced to choose between the two, we'd take the Axis. Are we high? No. The sad fact is that the Polywell system comes equipped with onboard sound and garage-sale speakers, whereas the Axis sports a Sound Blaster Live! Platinum and Cambridge Soundworks FPS2000 Digital 4.1 speakers. Sure, we routinely bash Cambridge Soundworks speakers when they're included with a system, and we stand by that rule of thumb. While they're by no means the best 4.1 speakers on the market, they're a hell of a lot better than the asstacular speakers that come with the Polywell, and that system's onboard audio isn't even in the same league as the Axis's SB Live! Platinum.

Despite our nitpicking, the Axis Terra AXA is a very solid system. Performance was spot-on considering its specs, and its construction quality is second-to-none. If it was a bit faster, it'd be Kick-Ass, for sure. And if it was faster *and* shipped with better speakers, we'd tell Axis that we "lost" it and were unable to send it back.

—Josh Norem

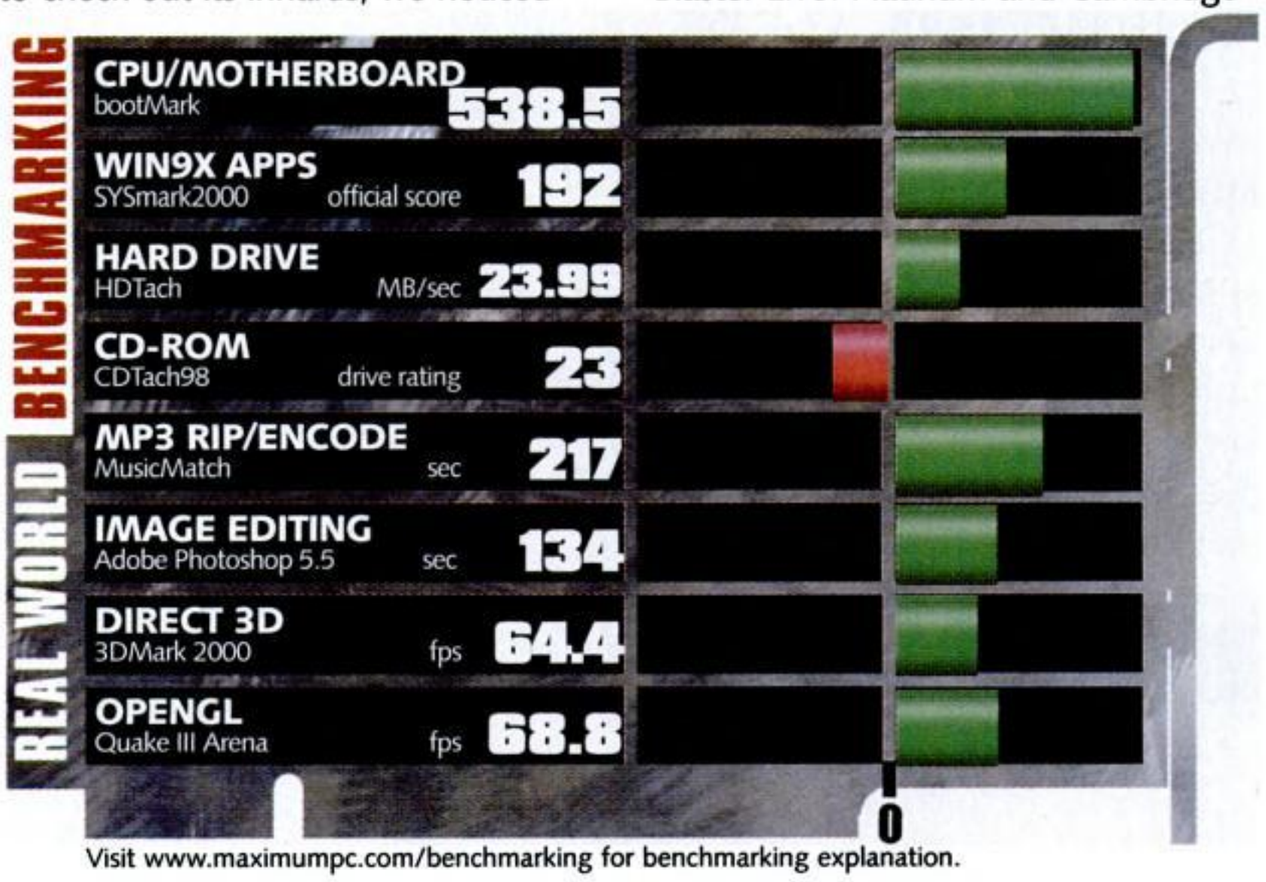
UNDER THE HOOD

THE BRAINS	
CPU	AMD Athlon Thunderbird 1GHz
L2 Cache	256K full speed
RAM	256MB PC133 SDRAM
Motherboard	FIC AZ11 Socket A
Drive Bays	Three 5.25-inch, Three 3.5-inch
I/O Ports	Two PS/2 | Two USB | One parallel | One serial | S/PDIF in | S/PDIF out | Line in Headphone jack | MIDI in | MIDI out Digital out | Microphone | Digital out TV-out
DISPLAY	
Video	Leadtek Winfast GeForce 2 GTS 64MB DDR SDRAM
Monitor	Hitachi SuperScan CM715 19-inch (18-inch viewable, 0.22 horizontal dot pitch)
Refresh@ Max Res	75Hz@1600x1200
STORAGE	
Hard Drive	Maxtor DiamondMax Plus 40GB, ATA/66 7,200rpm
DVD	Pioneer DVD-115 16x
CD-RW	Hewlett-Packard CD-Writer 9300i
Removable	Iomega 250MB Zip
NETWORKING	
Fax/modem	Conexant/Rockwell 56k PCI voice modem
NIC	3COM 905TX 10/100 PCI
SOUND	
Soundcard	Sound Blaster Live! Platinum
Speakers	Cambridge Soundworks FPS2000 Digital
THE BUNDLE	
Easy CD Creator 3.5c | *Direct CD* | *HP Simple Backup* (complete CD-RW suite) | Intervideo *WinDVD* | Microsoft *Office SBE*	

BOOT 1:13 DOWN 0:04

PLUSES
- Great components throughout
- Solid construction
- State-of-the-T-bird-performance

MINUSES
- Boring case
- Cambridge speakers. Feh.
- Slower than last month's similarly spec'd Polywell system



Visit www.maximumpc.com/benchmarking for benchmarking explanation.

MAXIMUM PC VERDICT 9

$3,200 ($2,800 without monitor) | Axis Systems
Buy www.SeeMeBuyMe.com
877.751.7647 | ID#1014

Copyrighted material

EXPANSION NOTES

Whether you want open slots or room to maneuver, the Axis has both. Two free PCI slots and a free DIMM are ready and willing to be filled with love.

EXPANSION MAP

AGP:	GeForce 2
PCI:	Free
PCI:	SB Live!
PCI:	Modem
PCI:	Nic
PCI:	Free

IRQS

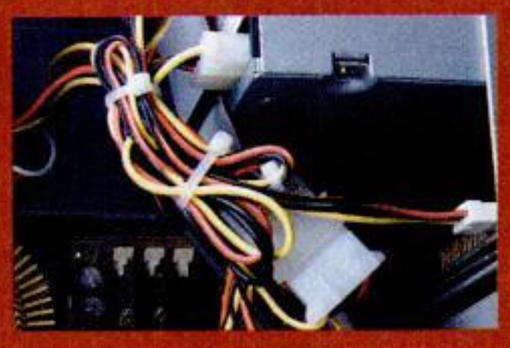
00	System Timer
01	Keyboard
02	Interrupt Controller
03	Creative SB Live!
03	IRQ Holder
04	COM 1
05	SB16 Emulation
06	Floppy
07	LPT 1
08	System CMOS
09	Conexant PCI Modem
10	GeForce 2 GTS
10	IRQ Holder
11	Via PCI to USB Controller
11	3COM Etherlink 10/100
12	PS/2 Mouse
13	Numeric Data Processor
14	Bus Master Controller
14	Primary IDE Controller
15	Secondary IDE Controller
15	Bus Master Controller

DMAS

01	SB16 Emulation
02	Standard Floppy
03	ECP Printer Port
04	DMA Controller
05	Creative SB16 Emulation

The Achilles heel. The Cambridge Soundworks FPS2000 Digital speakers are the only substandard component in this configuration. They're better than most speakers, but they're far from the best.

The flux capacitor. This is actually an AMD Thunderbird processor running chilly at 1GHz, thanks to this bizarre-looking heatsink/fan. A fan to move air out of the case would be nice, but it's not necessary.



A bundle of joy. All interior wires are exquisitely wrapped with plastic ties, and all excess cabling is tucked away nice and cozy. The folks at Axis are seriously anal retentive, and we like it.

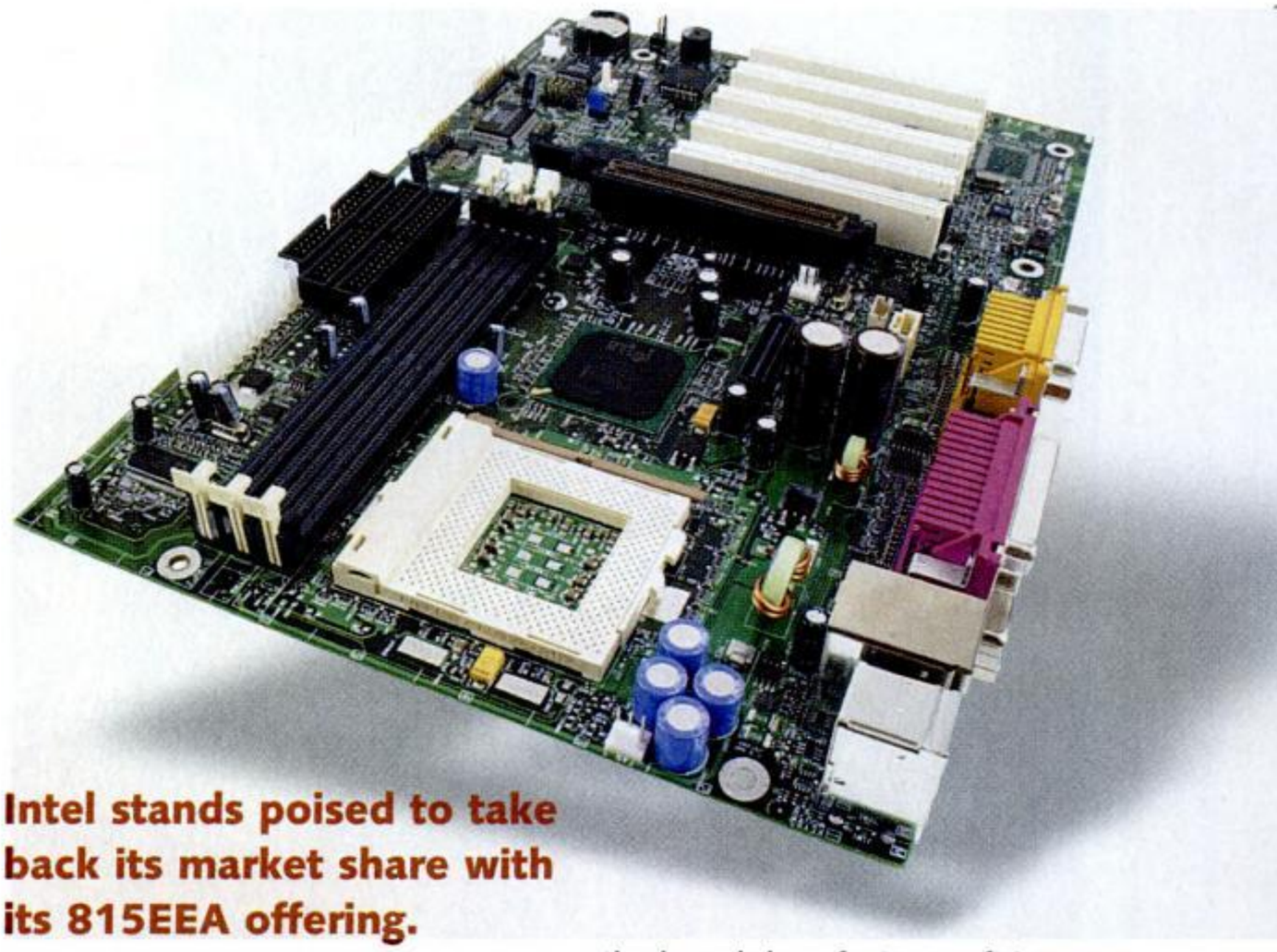
No empty bays for you. The Axis system has choice components in every drive bay. Those looking to add a second hard drive or some other gadget will have to invest in a larger case.

Copyrighted material

A Tale of Two Mobos

INTEL AND VIA FIGHT IN THE LOW-END MOTHERBOARD ARENA

Just a few years ago, investing in an Intel-based chipset was the safe, smart thing to do—the silicon was stable and compatible with a host of CPUs. But times have changed. Blunders in the making of its 810 and 820 chipsets and competitive pressure from VIA's SDRAM-lovin' Apollo Pro 133a chipset have forced Intel to step up with the 815 and 815E. Which one will lead in this motherboard mambo? Here's the straight dope.



Intel stands poised to take back its market share with its 815EEA offering.

Intel 815EEA

The 815 chipset family (**www.intel.com**) is intended for low-end desktop systems based on PC133 SDRAM and Socket 370 Pentium IIIs and Celerons. Both the 815 and the 815E come with integrated graphics care of Intel's i752 video technology, but the 815E adds the I/O Controller Hub2 (ICH2). This hub gives you support for two additional USB ports, ATA/100, and an extra PCI slot (for a total of six slots). Toss in integrated LAN support and you can clearly see the embarrassment of riches that the 815E brings to the desktop. The 800 series chipsets (which include the 810, 815, 815E, 820, and 840) also trump the vaunted Intel 440BX chipset by doubling system I/O throughput to 266MB/sec.

So how is the 815E implemented in Intel's own mobo? Well, for some unknown reason, the 815EEA includes just five PCI slots. You also get an AGP slot, and—hooray!—there are no ISA slots. And with its built-in Ethernet support, the mobo is ready for broadband right from the get-go. In fact, the only major amenity this board lacks is support for more than 512MB of RAM. Sure, not everyone needs even this much memory, but you never know where your upgrading adventures will take you. At least old Chipzilla threw in ATA/100 support for the new hard drives hitting store shelves. Intel also tossed in an AMR slot, which takes up residence where the ISA slot would be. We certainly don't encourage you to fill the AMR slot, but if you don't cause harm, we won't call foul.

The Soyo SY-7VCA is an overclocker's dream come true. Too bad its VIA chipset isn't as fast as Intel's 815.

Running *Quake III* at 1024x768, the Intel board put a beat-down on the VIA-based Soyo board by more than 8fps. The Intel board shined even brighter in the Sisoft *Sandra* tests. In the streaming integer and FPU tests, the 815EEA chimed in with 400MB/sec and 434MB/sec respectively. That's about 60 percent more throughput than the Soyo board piped out.

Not everything in Chipzillaland is rosy, however. Looking to muck about in this sucker's BIOS? Get ready to open up your case. While the board does feature soft jumpers in the BIOS, they can only be enabled by first switching a hard jumper on the PCB. Once you've tweaked your desired settings, you have to shut down and move the jumper back.

The 815EEA features onboard sound and graphics. Not *good* onboard sound and graphics, mind you, but they're included. We advise you to ignore both, and install a nice AGP card and Sound Blaster Live! card. Anything is better than these holdovers from last century.

These are just minor flaws, really. What counts is the fact that the 815EEA was extremely stable throughout testing, part of which involves stuffing the PCB to the brim with a full complement of components. We never witnessed a blue screen, GPF, or other such hassles. With the right audio and video components, this mobo will rock anyone who's not interested in overclocking.

Soyo SY-7VCA

With more bus speed options than you can shake a stick at, this mobo would appear to be an overclocker's fantasy. Unfortunately, once we donned our geek goggles and took a closer look, we discovered that the Soyo SY-7VCA has problems in other areas.

Soyo's latest board (**www.soyo**

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

.com) is based on the VIA Apollo Pro 133a, which has become a popular alternative to Intel's pricey i820 chipset. The problem lies in the fact that i820 is wedded so closely to Rambus' Direct RDRAM, which is known around these parts as Richie Rich RAM. VIA's chipset, meanwhile, is married to inexpensive PC133 SDRAM, and thus has been selling like hot cakes and appearing in a host of mobos slated for the Pentium III arena.

Like Intel's board, the SY-7VCA features a 4X AGP slot, along with five PCI slots, one ISA slot, and a blasted AMR slot that simply takes up precious PCB space that would be better used for more I/O options or fan connections. With 32 frontside bus speeds ranging from 66MHz to 166MHz, overclockers will gravitate toward the Soyo like children chasing after the ice cream truck. But, alas, where there's good news, there's usually bad news. And indeed, Soyo placed its floppy connector and LED power connector block in inconvenient places. In our full-size tower case, which features its floppy drive up at the top, we had trouble stretching the floppy cable to its connector low on the motherboard, and the LED block is so close to the ISA slots that installation of a long-length ISA card is nearly impossible.

Soyo's board ran a bit slower during benchmarking than Intel's 815 board. It only scored a direct hit against the Intel board in our *Photoshop* test, where it sped through the barrage of scripted actions a full five seconds faster. The Soyo also scored a respectable 159 in *SYSmark 2000*, but this was still three points shy of the Intel board.

But benchmarks aren't everything in moboland. Features and stability are certainly more important at the end of the day. Soyo has shipped the board with an updated AWARD BIOS menu. Kick in three DIMM slots for a total of 1.5GB SDRAM, and you have the beginnings of a well-rounded machine. And in our stability tests, the board didn't bat an eye or issue a whimper when we loaded it with components.

This board might be great for overclockers who don't have ISA cards or full tower cases, but it isn't designed for everyone, and it runs more slowly overall than the 815E-based Intel mobo. In sum, if you're an overclocker, look into it. If you're not, look elsewhere.

—Scott Tarr

INTEL 815EEA — 8

$165 | Intel
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#09tk

INTEL
PLUSES
Massive throughput
Stable
No ISA slots
MINUSES
Not really jumperless
Not overclockable

SOYO SY-7VCA — 7

$145 | Soyo
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#09TK

SOYO
PLUSES
Overclockable as hell
New BIOS
Large RAM capacity
MINUSES
Not very fast during testing
Inconvenient PCB layout
No ATA/100 support

DARE TO COMPARE

MANUFACTURER	SOYO SY-7VCA	INTEL 815EEA
Chipset	VIA Apollo Pro 133a	Intel 815E
Supported processors	Socket 370 Celerons Socket 370 350-1000MHz Pentium IIIs	Socket 370 Celerons Socket 370 Pentium IIIs
Expansion slots	1 AGP/ 5 PCI/ 1 ISA	1 AGP/ 5 PCI
Memory support	PC100/PC133, 3 DIMM slots, 1.5GB SDRAM max	PC100/PC133, 3 DIMM slots, 512MB SDRAM max
Formfactor	Baby ATX	Baby ATX
Overclocking rating	Excellent	Poor
Other	Onboard audio	Onboard audio/video/integrated LAN/ ATA-100 support/Digital video output

BENCHMARKS	SOYO SY-7VCA	INTEL 815EEA
Quake III Timedemo 1	49.5 fps	**57.9 fps**
SYSmark 2000	159	**162**
Sisoft *Sandra MIPS*	2135	**2157**
Sisoft *Sandra MFLOPS*	1058	**1069**
Sisoft *Sandra* Streaming Integer	243MB/sec	**400MB/sec**
Sisoft *Sandra* Streaming FPU	267MB/sec	**434MB/sec**
3DMark 3D Marks	4834	**5019**
3DMark CPU	384	**411**
Photoshop 5.5	**190 secs**	195 sec

INTEL 800-SERIES CHIPSET FIASCOS

Intel had its share of problems with the early 800 series chipsets. The 810, while supporting AGP 2x, didn't support external AGP slots, so you were forced to use the graphics integrated into the chipset unless you went with an add-in PCI card. The 810 also lacked support for Coppermine P-IIIs.

The 820 chipset, meanwhile, stumbled at launch when it was discovered that 820 motherboards might suffer memory loss problems if a third RIMM slot was installed on the board. The fix? Recall the old mobos and release new ones with just two RIMM slots. But the story didn't end there. After cutting the third RIMM slot, Intel added the Memory Translator Hub (MTH), which enabled SDRAM support on 820 motherboards. This provided an alternative to pricey Direct RDRAM, but the MTH was soon identified as the culprit behind lockups and data errors. The end result was another motherboard recall, costing Intel $250 million.

This story does have a happy ending. The MTH has been updated to "MTH2," which allows the newer version i820E chipset to use SDRAM with no problems. On the low-end front, Intel's newest chipsets, the 815 and 815E, best the 810 in all-around support.

The rumor mill has it that Intel is hoarding large quantities of the 815 chipset in order to sell more of the i820E. Intel says this isn't the case, and explains that because the 815 has so much packed into it, it's more complicated to produce than the 820, thus yields are lower.

Copyrighted material

ATI Radeon 64MB DDR

AS FAST AS IT IS PRETTY—AND IT'S PRETTY DAMN FAST

The Radeon almost makes up for the lame performance of previous ATI boards.

After a string of near misses, ATI (**www.ati.com**) finally scored a winner with the Radeon 64MB DDR. With a full feature set—including an advanced T&L implementation and some nifty z-buffer enhancements—the Radeon is the first card to hold its own against the mighty GeForce 2 GTS. Not only does the card boast awe-inspiring frame rates, it also offers superb visual quality, putting nVidia cards to shame and rivaling the Matrox G400, the current visual-quality champ.

PLUSES
- Fast at high resolutions
- Gorgeous 3D
- Excellent DVD playback

MINUSES
- Slow 2D

THE SPECS

LOCAL MEMORY	64MB DDR SDRAM
MAX REFRESH AT 1280X1024	130Hz
MAX RESOLUTION 16-BIT	2048x1536
MAX RESOLUTION 32-BIT	2048x1536
CLOCK SPEED	183MHz/183MHz (366MHz)

So how did ATI finally get 3D acceleration right? First, the chipset employs new z-buffering techniques (dubbed HyperZ), which optimize the memory bus. Second, each of the Radeon's two pixel pipelines can apply three textures every clock cycle. This allows for complex multitexturing and blending operations in a single pass (GeForce 2's two pixel pipelines can apply only two textures each cycle). Third, the Radeon has an advanced T&L engine (called Charisma) that is capable of pushing 30 million triangles per second, and supports advanced character modeling features such as four-matrix vertex blending.

As 3D chipsets become more and more powerful, onboard video memory has more and more trouble keeping up with the pace of rendering. ATI's HyperZ techniques mitigate this bottlenecking by applying lossless compression to z-buffer information. Using HyperZ, along with a few other tweaks, ATI has been able to turbocharge the Radeon's memory bus with 20 percent more performance. When that performance increase is combined with 183MHz DDR SDRAM (which is about 10 percent faster than the 166MHz DDR RAM found on standard GeForce 2 cards), the Radeon performs with aplomb at resolutions up to 1280x1024.

So the memory bus is theoretically 20 percent faster—that's just dandy. But what kind of performance boost does that give us in the real world? We found the Radeon performed as well as, or better than, GeForce 2-based cards in every benchmark. With a score of 66.4fps in our *Quake III* demo001 benchmark, the Radeon easily surpassed its closest competition. And we expect to see performance improvements as the driver gnome at ATI further tweaks the drivers.

Visual quality was superb as well. While running our *Quake III* benchmarks in the Lab, even the most jaded lab monkeys did a double-take at the rich, vibrant colors that the Radeon was pumping out in full 3D glory. See our screenshots in the Videocard section of Maximumpc.com, by clicking on Visual Quality

Our only real gripe with the Radeon is its lackluster 2D performance. Regardless, even "slow" 2D is pretty damn fast, and it's possible that driver revisions will help improve 2D application performance in the future. We also had some problems when testing the Radeon on our Athlon test system, but they were solved by downloading the 4-in-1 driver from VIA's web site.

The Radeon is a total package, combining blazing-fast, spectacular-looking 3D with excellent DVD playback. We're thrilled that there's finally competition for the GeForce 2.

—Will Smith

DARE TO COMPARE

MANUFACTURER	HERCULES 3D PROPHET II 64MB	RADEON 64MB DDR
Driver Version	5.22	4.12
Quake III demo001 1024x768 32-bit color	57.0fps	**66.4fps**
Quake III quaver 800x600 32-bit color	76.0fps	**79.6fps**
MDK2 800x600 32-bit color	**102fps**	78fps
3DMark 2000 game 1-medium 1280x1024 32-bit color	42.1fps	**47.8fps**
SysMark 2000 Graphics Apps 1600x1200 16-bit color	**603**	528

MAXIMUM PC VERDICT 9

$350 for 64MB ($200 for 32MB version) | ATI
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1017

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

Get it all in as little as six months

Now you can build an exciting future — one filled with more money, better opportunity, and real success! All it takes is ambition, drive, and the valuable skills you'll learn from Harcourt Learning Direct at-home training.

Picture yourself in the career you really want, doing work you enjoy and earning great money. Then start making that dream come true by enrolling with Harcourt. Choose from over 80 career programs, including PC Repair, Visual C++® Programmer, Java® Programmer, and more.

At-home training is the fast, convenient way to reach your goals. No classes to attend, no need to change your schedule — just proven training that works.

Start a new life in as little as six months from today! Launch a new career, advance in your current one, even open your own business. Your goals are all within your grasp when you train with Harcourt.

Take advantage of this exciting opportunity! Call or write today for FREE information on how you can train at home for a new career.

Mail Coupon or Call Toll Free

1-800-572-1685 ext. 1698

Call anytime, 24 hours a day, 7 days a week.

www.harcourt-learning.com

Harcourt Learning Direct

Student Service Center
Dept. AFYSA0S
925 Oak Street
Scranton, PA 18515-0700

YES! Please send me FREE information on how I can train at home for an exciting new career. I understand there is no obligation. CHECK ONE BOX ONLY.

Associate in Specialized Business Degree Programs
- ☐ 60 Business Management
- ☐ 61 Accounting
- ☐ 80 Business Management - Marketing Option
- ☐ 81 Business Management - Finance Option
- ☐ 64 Applied Computer Science
- ☐ 68 Hospitality Management

Associate in Specialized Technology Degree Programs
- ☐ 62 Mechanical Engineering Technology
- ☐ 63 Civil Engineering Technology
- ☐ 65 Electrical Engineering Technology
- ☐ 66 Industrial Engineering Technology
- ☐ 67 Electronics Technology

Career Diploma Programs
- ☐ 38 PC Specialist
- ☐ 53 Desktop Publishing and Design
- ☐ 43 PC Fundamentals*
- ☐ 27 PC Repair
- ☐ 44 A+* Cert. Test Prep.*
- ☐ 07 High School
- ☐ 59 Catering/Gourmet Cooking
- ☐ 23 Medical Office Assistant
- ☐ 24 Dental Assistant
- ☐ 19 Bartender
- ☐ 04 Auto Repair Technician
- ☐ 390 Bookkeeping
- ☐ 05 Hotel/Restaurant Management
- ☐ 146 Physical Therapy Aide
- ☐ 149 Jewelry Repair Technician
- ☐ 22 Wildlife/Forestry Conservation
- ☐ 88 Veterinary Assistant
- ☐ 56 Pet Groomer
- ☐ 14 Air Conditioning and Refrigeration
- ☐ 31 Professional Locksmithing
- ☐ 02 Basic Electronics
- ☐ 13 Professional Secretary
- ☐ 06 Electrician
- ☐ 32 Artist
- ☐ 70 Small Business Management
- ☐ 08 Paralegal
- ☐ 12 Interior Decorator
- ☐ 85 Drafting
- ☐ 54 AutoCAD*
- ☐ 94 Fitness and Nutrition
- ☐ 87 TV/VCR Repair
- ☐ 03 Child Day Care Management
- ☐ 40 Photographer
- ☐ 76 Freelance Writer
- ☐ 42 Dressmaking and Design
- ☐ 160 Professional Bridal Consultant
- ☐ 30 Floral Design
- ☐ 26 Teacher Aide
- ☐ 15 Home Inspector
- ☐ 102 Professional Landscaper
- ☐ 84 Pharmacy Technician
- ☐ 39 Medical Transcriptionist
- ☐ 381 Medical Insurance Clerk
- ☐ 35 Travel Agent
- ☐ 72 Appliance Repair
- ☐ 58 Private Investigator
- ☐ 89 Small Engine Repair
- ☐ 83 Web Page Designer
- ☐ 151 Plumber
- ☐ 387 Telecommunications Technician
- ☐ 384 Furniture & Cabinet Maker
- ☐ 105 Computer Graphic Artist
- ☐ 383 Occupational Therapy Aide
- ☐ 104 Carpenter
- ☐ 145 Home Remodeling and Repair
- ☐ 389 Spanish*
- ☐ 73 Court Reporter

Computer Programming
- ☐ 01 Programming in BASIC
- ☐ 37 Visual Basic*
- ☐ 36 Visual C++*
- ☐ 82 Java*
- ☐ 69 COBOL*

*Certificate Programs

Name _____ Age _____

Street _____ Apt. # _____

City/State _____ Zip _____

Phone ( ) _____

21ZA

Copyrighted material

Through Thick and Thin

THE MR. AND MRS. SPRAT OF SONY DISPLAYS

Leave it to Sony (**www.ita.sel.sony.com**) to send us two remarkable monitors of nearly diametrically opposite design. One is an impossibly thin, 15-inch, flat-panel LCD that would fit right in at the Museum of Modern Art. The other is a humongoid, 24-inch, flat-screen CRT that could change the life of anyone who needs a wide expanse of high-res screen real estate. Let's take a look.

With a new silvery chassis, the FW900 is beautiful both inside and out.

N50PS

PLUSES
- Super-high-tech looking
- No apparent video noise
- Great screen uniformity
- Great color repro

MINUSES
- Needs a higher pedestal
- Can't outperform SGI and Apple flat panels

FW900

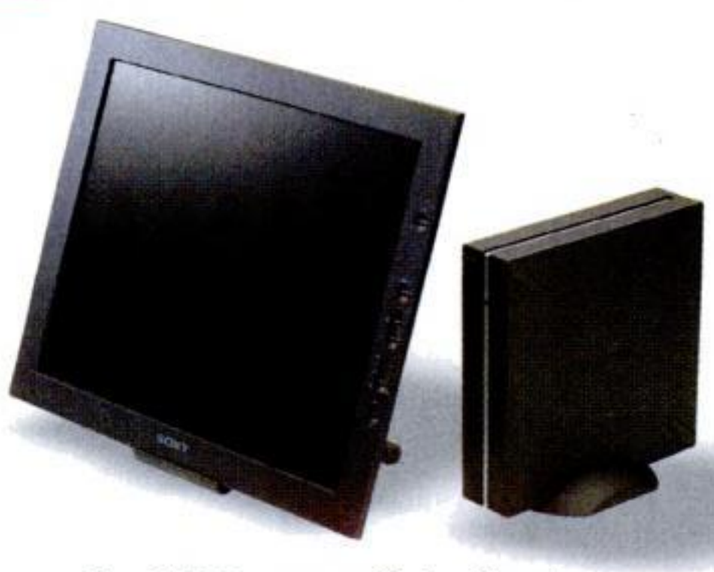
PLUSES
- Largest aperture grille display around
- Admirable brightness and corner geometry
- Best onscreen controls around
- Incredible refresh rates

MINUSES
- Incongruity in rendering fine lines
- Focus degrades on edges

SDM-N50PS

The N50PS's sliver of a chassis sits on an adjustable "photo stand." Prop it up horizontally for landscape mode or vertically for portrait mode. The panel's support circuitry sits in an accompanying "media engine" that can be hidden out of sight. By shunting all the bulky electronics to the media engine, Sony was able to engineer the thinnest display we've ever seen. The panel rides a bit low in the saddle; the photo stand could use a pedestal of its own.

Sharp body aesthetics aside, the N50PS performed extremely well. Most importantly, the panel exhibited almost none of the shimmery video noise associated with analog-to-digital conversion. In fact, the pixel tracking and timing lock was so spot-on, we're beginning to wonder if flat panels even need a pure digital interface. Screen uniformity was also excellent—no darkening around the edges, which is a common problem in LCDs. The N50PS also appears to be able to run full 16-bit color without dithering (though the panel's colors were noticeably less vibrant than those of our Sony F500 control CRT). Bottom line: The N50PS looks and performs better than any other 15-inch flat panel we've tested. As long as you're happy running 1024x768 for the rest of your life, and you don't need more screen real estate, this panel won't disappoint you.



The N50PS comes with dual inputs so you can feed the signals of two different computers into your swank new display.

GDM-FW900

Sony's grand behemoth sports a 22.5-inch-viewable, flat-screen display. We reviewed the FW900 at 1920x1200 at 85Hz, and found that it delivered a brighter picture than the W900, its non-flat, 24-inch predecessor. The FW900 also performs as well as the 21-inch Sony F500 in maintaining geometric integrity in the corners. It's very difficult to engineer a bright screen and good corner geometry when your electron beams need to hit a 24-inch expanse, and the engineering hurdles presented by flat-screen technology only exacerbate the situation. Kudos to Sony for developing a geometrically precise screen under such conditions.

This pro workstation monitor can hit 2304x1440 at 80Hz, and boasts a variable 0.23mm to 0.27mm stripe pitch. Fine image detail is incredibly sharp in the middle at 0.23mm, but visibly degrades as you move to the left and right perimeters. We were particularly impressed with the monitor's awesome color convergence: It was near perfect out of the box, and there are even convergence controls for tweaking if necessary.

Overall, the FW900 is an engineering marvel, offering a full set of onscreen controls for precise callibration and the classic Trinitron screen vibrancy across a marvelously decadent expanse. Just one caveat for CAD folks: As is the case with a few other aperture grille monitors, fine horizontal lines appear thicker and brighter than fine vertical lines of exactly the same width. This might bug you during wireframe modeling.

—Jon Phillips

SDM-N50PS 9

$1,150 | Sony
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1019

GDM-FW900 9

$2,500 | Sony
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1018

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

Dolby Digital Donnybrook

PUTTING THE 'SURROUND' IN SURROUND-SOUND SPEAKERS

Admit it, you spend your nights dreaming of six discrete channels of crisp, clear, surround sound, but wake up frustrated because no one's making a truly captivating Dolby Digital 5.1 speaker system. Will you rest easier tonight knowing that your PC is about to become a home theater system? Maybe. Maybe not. Read on.

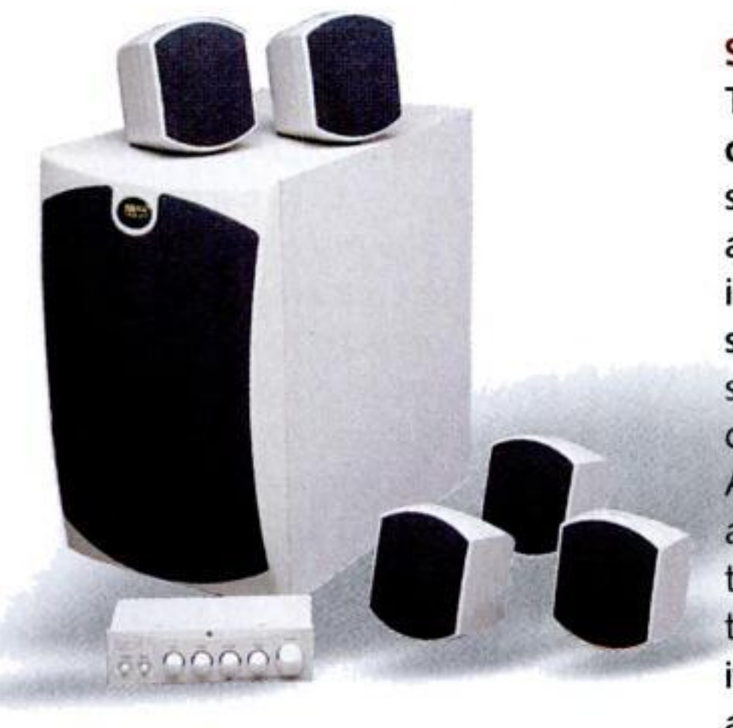
The DigiTheatre offers crisp 5.1 surround sound, but lacks power and sports a weak subwoofer.

VideoLogic DigiTheatre

VideoLogic (**www.videologic.com**) has been on a hot streak in our magazine lately, but that streak has come to an end. Sorry, VideoLogic, but your DigiTheatre speakers didn't impress our spoiled ears. The set lacks power, is made of cheap materials, and simply costs too much.

Each of the system's six speakers feels thin and flimsy, and projects about as much warmth as one would expect from the lightweight construction. The system pumps 62.5 watts of power, which is sufficient for *Fried Green Tomatoes*, but too anemic for action movies and music CD playback.

The system's crown jewel is its Dolby Digital 5.1 decoder, which delivers crisp audio to all six channels using the Zoran DSP. The unit supports both optical and coaxial S/PIDF input and uses a six-channel output cable for connecting to any six-channel amplifier. The decoder does its job just fine, and might even justify the system's high cost if it weren't for the lackluster speakers, the subwoofer in particular. Boasting only 25 watts of power and almost no ability to hit the lower end of its soundscape, the subwoofer is the system's weak point. While the DigiTheatre speakers are better than the Cambridge Soundworks DTT2500s for Dolby Digital 5.1 sound (which isn't saying much), they're inadequate for games and music, and cost a pretty penny.



Don't let their unassuming appearance fool you; these suckers are loud and proud. There's even an optional AC-3 decoder for just $100.

S4 Midiland 7100

The Midiland 7100s (**www.midiland.com**) surprised us. The 100-watt system appears to be as cheaply made as the DigiTheatre, but produces impressive volume with above-average sound quality. The Achilles heel of this system is its lack of a Dolby Digital 5.1 decoder. Luckily, Midiland sells an ADS-2000 5.1 Dolby Digital decoder as an optional $100 add-on. Since the ADS-2000 decoder came with the DigiTheatre speakers, we hooked it up to the Midiland speakers for a decoder-enabled test drive. The surround sound during DVD movie playback was amazing, much better than that of the DigiTheatre system. The Midiland's 50-watt subwoofer is twice as powerful as the DigiTheatre unit, and really flexed its muscles with excellent low-frequency reproduction during the opening scene of *Saving Private Ryan*.

The speakers are made of a plastic and metal composite called Platallic that offers more warmth and richness than the plastic used in the DigiTheatre speakers. The five 10-watt satellites produce clear tones as well, although they distort heavily at higher volumes.

The speakers' simple controls were a blessing after fiddling around with the confusing DigiTheatre remote controls for an hour. The Midiland control panel can be housed in any free 5.25-inch drive bay, allowing quick access to volume, bass, etc. The only reason these speakers didn't win a Kick Ass Award is because the 5.1 decoder is optional, not standard.

—Josh Norem

VIDEOLOGIC

PLUSES
Comes with a decoder

MINUSES
Lackluster power
Weak subwoofer
Overpriced

MIDLAND

PLUSES
Incredible bang for the buck
Controls fit in PC's front bezel

MINUSES
No decoder

VIDEOLOGIC DIGITHEATRE **6**

$400 | VideoLogic
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1020

S4 MIDLAND 7100 **9**

$200 | S4 Midiland
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1021

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

PC Recording Studios

WHEN AUDIO'S MORE THAN JUST A GAME

Most "over-the-counter" soundcards are designed for gaming, so the focus is on playing sound effects, not music. Even worse, most soundcards offer atrocious recording quality; you wouldn't want to use these suckers for anything more demanding than voice dictation. But don't lose faith, audiophiles. Pro-quality PC audio is possible with the right equipment. Join us as we take a walk on the wild side of high-end PC audio components.

Digital Audio Lab's CardDeluxe packs a lot of functionality and power in a small package.

Digital Audio Labs CardDeluxe

The original DAL CardD (**www.digitalaudio.com**) was the first pro audio soundcard for the PC, arriving in the days when CPU speeds were in the single digits. The CardD remained the standard for radio stations and PC-savvy musicians right through the Pentium II era, but its outdated ISA architecture and unbalanced connectors (see sidebar) made it a prime candidate for a complete overhaul. Its replacement, the CardDeluxe, offers PCI speed, much higher audio quality, a digital I/O, and the ability to sync with additional cards for scalability. This soundcard is designed to give musicians, broadcasters, and other audio fanatics the cleanest, quietest recording quality and the most faithful playback.

THE SPECS
CARDDELUXE INPUTS/OUTPUTS
Two-channel balanced analog in/out via TRS jacks I RCA S/PDIF (optical also) I AES/EBU I TOSLINK I Additional cards can be synched to add inputs

THE SPECS
WAVE 496 INPUTS/OUTPUTS
Four-channel balanced analog in/out via TRS jacks I MIDI I S/PDIF I Two additional cards can be synched to provide a max of 12 analog I/Os

THE SPECS
U2A INPUTS/OUTPUTS
Two-channel analog in/out via TRS jacks I RCA S/PDIF I TOSLINK (optical)

Balanced 1/4-inch analog jacks, along with ample filtration on the PCB, virtually eliminate the hiss, hum, and static caused by Radio Frequency Interference (RFI). This is a very quiet card. Its signal-to-noise ratio (SNR) is the lowest of the cards we tested. Digital analysis in *Cool Edit 2000* audio production software revealed a 96.3dB SNR in CD-quality 16-bit, 44.1KHz recordings. The CardDeluxe can also record at the new, Ultra High Fidelity 24-bit, 96KHz standard created for upcoming DVD Audio. Ultra High Fidelity recordings achieve an incredible 107.7dB SNR. This is less noisy than the sound of blood circulating through your ears.

Connecting to other digital audio gear, such as MiniDisc decks, is easy with the RCA S/PDIF digital connectors. An optional optical S/PDIF connector is also available. And if two analog ins and outs aren't enough, the card can be synched to additional cards to allow as many connectors as you need.

The CardDeluxe does not stoop to include any consumer amenities. There's no connector to attach a CD-ROM or CD-R directly. Also, connecting cables directly to the card may be a hassle depending on your cabling setup.

But CardDeluxe does two things superbly—record and play back audio. During testing, drivers for Win9x and NT 4 installed quickly and ran flawlessly. Win2000 support, however, has been beset by issues in the new WDM driver model. Expect it to be several months before those are ironed out.

The Wave/496's eight analog and MIDI interfaces offer the ultimate in connectivity.

Gadget Labs Wave/496

Anyone who's ever had even the most modest musical ambitions can appreciate the Wave/496's virtues (**www.gadgetlabs.com**). The device, a four-channel pro audio card that connects with a breakout box, was primarily designed to replace the four-track cassette recorder as the cheap and easy way to turn a musical idea into a lo-fi demo recording. Just add the latest audio sampling/composition software to the Wave/496 and you'll have Vanilla Ice sampling *your* tracks soon. The unit's input capability far surpasses that of older analog gear at any price. It offers four channels in and out, includes MIDI, and has an optional digital I/O. The Wave/496's balanced design yields results that match the CardDeluxe's 96.3dB SNR at CD quality, and fall only slightly behind the CardDeluxe with 104.9dB SNR

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

at 24/96. The AD/DA converters don't sound quite as musical to our ears as those in the CardDeluxe, but given the card's advanced features, it's a minor flaw.

The card has a cable connection to eight 1/4-inch jacks, as well as an additional cable for MIDI. Although it's somewhat bulky, the external breakout box is tremendously convenient, allowing professionals to plug in enough cards to capture a symphony orchestra. A CD-ROM audio connection is also supplied for audiophiles who wish to do a bit of slumming.

Installation and operation under Win9x and NT 4 was flawless. But getting the Wave/496 to run under Win2000 was a major ordeal. First, it wouldn't work with our dual-CPU test system; on another machine, we had to shut off plug-and-play in the BIOS. Gadget Labs says new Win2000 drivers are forthcoming, so we recommend sticking with Win98 until they arrive.

The only glitch that kept us from bestowing a Kick Ass Award on this product was a bug that popped up during recording. A spike in the –60dB range marred the first second of any audio in Win2000 or NT. Tech support indicated that earlier driver versions had suffered this, but that the problem had been rectified. Yeah, right. To be fair, there was no problem under Win9x. Still, having the near-perfect silence of –100+dB disturbed by such a raucous interruption shattered the serene splendor associated with Kick Ass status.

The U2A is fine for **digital audio work,** but the **convenience of USB comes** at the **cost of analog audio quality.**

Waveterminal U2A

One of the complaints against PC-based pro audio has been the hassle of weeding through IRQ settings and the like. While we think these installation issues are more of a challenge than a problem, we'll concede that it's much easier to use a USB audio device such as the Waveterminal U2A (**www.tracertek.com**).

The U2A sports not only two sets of 1/4-inch analog jacks, but optical and RCA S/PDIF connectors as well. Unfortunately, the idea is better than the execution. The analog audio quality is only so-so, and the ease of USB installation is overshadowed by driver glitches. And it seems that the current USB interface is not quite up to the task; bandwidth limitations put it well below the capabilities of the PCI bus. It may take the coming upgrade to the USB 2.0 spec to make USB a decent interface for audio.

According to the company's description, the U2A's analog section is driven by high-quality 24-bit converters and balanced connectors, but benchmarks of the SNR were characteristic of unbalanced audio—76.0dB at CD quality under Win98 SE. The U2A is capable of 24-bit recordings, but unlike the other devices we tested, it doesn't support the highest sampling rates, topping out at 48KHz. Oddly, it tested a shade worse at the higher 24/48 rate with a 75.8dB SNR. That's sufficient for improving a laptop's internal audio, but it's by no means top-notch sound quality.

The packaging states that Win2000 drivers are included. The U2A seemed to install properly in Win2000, but the SNR specs were horrible—on par with the integrated PCI sound in an Intel Seattle BX motherboard. Apparently the box was printed in anticipation of these drivers. This, added to the dubious claim of a 100+dB SNR, caused our confidence to wane.

We were satisfied with the overall sound quality—until a bug spoiled our pleasure. Remember the spike that we heard in the beginning of recordings made with the Wave/496? The U2A experienced the same problem, only this time, the spike was louder. Worse, levels went wild if recordings started from anything but silence. Beginning the recording, *then* starting the music prevented this glitch, but it's far too easy to ruin a recording.

The U2A's shortcomings may be offset by its convenience, portability, and lower price. But we want something with good sound—not something that sounds good in the web site's description.

—Carl Lindemann

CARDDELUXE 8
$600 | Digital Audio Labs
Buy www.SeeMeBuyMe.com
877.751.7467 ID#1022

WAVE/496 9
$350 | Gadget Labs
Buy www.SeeMeBuyMe.com
877.751.7467 ID#1023

U2A 5
$250 | Tracer
Buy www.SeeMeBuyMe.com
877.751.7467 ID#1024

CardDeluxe

PLUSES
- Awesome sound quality
- Excellent drivers
- Includes digital I/O

MINUSES
- Relatively expensive
- No CD connector
- Internal connectors can be awkward

WAVE/496

PLUSES
- Excellent audio
- Added inputs
- MIDI support
- Breakout box for convenience
- Incredible price/performance

MINUSES
- Dubious Win2K support
- Recording glitch under NT

U2A

PLUSES
- Convenient and simple
- Digital I/O
- Inexpensive

MINUSES
- So-so audio quality
- Recording glitches
- Seemingly unbalanced connectors

FCC REGULATIONS

Ever wonder why the FCC inspects and certifies computers and other electronics? That's because each device acts like a tiny transmitter, emitting RFI, or Radio Frequency Interference. The FCC wants to make sure that the RFI doesn't impede the operation of other devices—such as hearing someone's CB radio coming over your phone line. A PC can generate plenty of RFI, depending on the quality of its power supply and motherboard. In fact, the inside of the box is generally inhospitable to delicate and detailed audio. Even worse, cables connecting the soundcard to a stereo or mixing board can act as antennas and actually draw in noise. Using "balanced" connections—where an extra wire is added to the usual pair to deliberately sop up RFI static—usually eliminates most of the problem.

AUDIO SPECS EXPLAINED

Audio quality is measured by the word length of the audio data and the number of samples taken per second. Think of the word length as the diameter of the pipe the data moves through. The sample rate is how many meters per second the substance flows. The CD standard is 16-bit/44,100 samples per second. That translates roughly to 10MB of data per minute recorded. The new "24/96" Ultra High Fidelity spec consumes some four times that amount of data for a denser, cleaner sound.

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

HP 3150 and Samsung 5100P

MULTIFUNCTION PRINTER MADNESS

HP

PLUSES
Dual paper paths
600dpi and 256 shades of gray ensure clarity

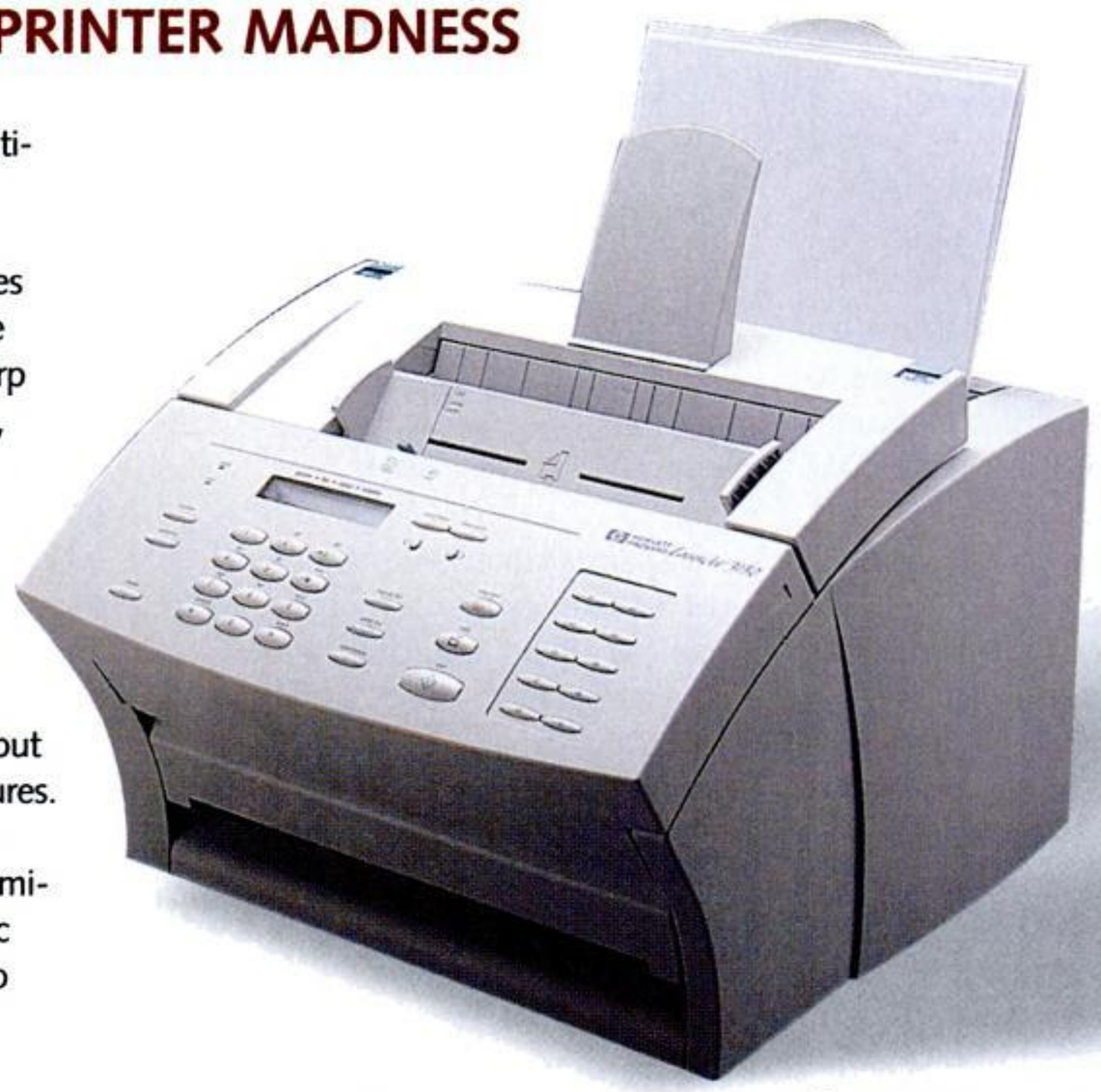
MINUSES
Bulkier than the Samsung
Slow page output

SAMSUNG

PLUSES
Small footprint
Excellent software package

MINUSES
Only 300dpi and 64 shades of gray
Expensive

This month we take a look at multifunction laser jet printers from Samsung and Hewlett-Packard. Boasting one-piece toner cartridges and plain-paper friendliness, these overachievers crank out razor sharp text with absolutely no smudging, and perform copy, fax, and scan duties to boot.



HP 3150

The HP 3150 (**www.hpshopping.com**) is a bit on the bulky side, but offers an impressive roster of features. Among the most innovative is the superb "Instant On" fuser that eliminates the warm-up time endemic to laser printers. The 3150 is also capable of handling an array of tasks at once, thanks to its dual paper paths and healthy 2MB data buffer.

Image quality is damn crisp thanks to its 600dpi and 256 shades of gray. For scanning, the device drops down to a 300dpi optical resolution, which seems like a big drop, but remember this isn't a flatbed scanner. Sadly, the high quality output isn't quick, averaging a poky six pages per minute.

The 3150 has stand-alone functionality so you can copy and fax without turning on your PC. Fire up your PC, though, and the 3150's networking capabilities allow you to print from multiple machines, designate print and fax schedules, and manage print queues. An excellent OCR software package allows you to scan documents directly into your word processing program, and the "scan to e-mail" function sends scans to your co-workers in a jiffy. Overall, the HP 3150 is a versatile and impressive document center.

THE SPECS

HP

HEAD
Laser REt head with microfine toner

MAX RESOLUTION
600dpi (300dpi scan)

HALFTONE CAPABILITIES
256 shades of gray

PAPER TRAY CAPACITY
100 sheets/10 envelopes

INTERFACES
Parallel

SOFTWARE DRIVERS
Windows 3.1x, 95, 98, NT 4.0, 2000

HP's 3150 impressed us with its features, network capabilities, and prints.

Samsung 5100P

The MSYS 5100P (**www.samsung.com**) is smaller than the HP 3150, yet costs $200 more and boasts less impressive specs.

Printing resolution is a modest 300dpi, with 64 shades of gray. Scanning resolution is a dismal 150dpi. The results are adequate for text or *PowerPoint* presentations, but photos and pictures are by no means the 5100P's forte. Images, both scanned and printed, can be spotty and lacking in detail. One might think that the Samsung would easily outpace the HP in print times, but the 5100P produces the same poky six pages per minute as the 3150.

The 5100P's saving grace is its *SmarThru* software package. An easy-to-use menu of mini-applications allows you to adjust the size and scale of scans and pictures; make changes and enhancements to photos; utilize the OCR software; schedule faxes, scans, and prints; and coordinate any job with e-mail.

Otherwise, the 5100P does much of what the 3150 does, just not as well. It's got the same 2MB data buffer as the 3150, but lacks the second paper tray. It can function as a network printer, but lacks the 3150's intuitive controls for managing print jobs from several machines.

The ease of use and the comfortable task management capabilities of the *SmarThru* package are valuable enough to make the MSYS 5100P worth considering, but sadly, not enough to garner a recommendation over the HP 3150, which costs less and offers more.

—Geoffrey Visgilio

THE SPECS

SAMSUNG

HEAD
Laser head

MAX RESOLUTION
300dpi (150dpi scan)

HALFTONE CAPABILITIES
64 shades of gray

PAPER TRAY CAPACITY
150 sheets/10 envelopes

INTERFACES
Parallel

SOFTWARE DRIVERS
Windows 95, 98, NT 4.0, 2000

Samsung's MSYS 5100P is easy to use, but overpriced and lacking in features.

HP LASERJET 3150 — **9**
$600 | Hewlett-Packard
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1025

SAMSUNG MSYS 5100P — **6**
$800 | Samsung
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1026

Copyrighted material

© 2000, VR Toolbox, Inc. The VR Worx is a trademark of VR Toolbox, Inc. Macintosh, QTVR, QuickTime and QuickTime VR are trademarks of Apple Computer, Inc., registered in the U.S. and other countries and used under license. Windows is a trademark of Microsoft, Corporation.

Announcing version 2.0 of The VR Worx, truly the greatest QTVR feature/function set in the world...

Partial Feature/Function Set

Apple Scriptable and PC Scriptable

Hyperstitcher

Object Movie with Panoramic Movie Background

Multinode Transitions

Optimized for the World Wide Web

Fast-Start Panoramas for the Web

Pano Image Import/Export at 10,000 x 3,000 pixels

Built-In Image Editors

Sound Support in Object Mode

Chroma-Key Background Knockout

Transparency Stitch Viewer

Frame Based Animation

Centering, Cropping, De-Wobbling along with more Special Effects

Unlimited Hot Spots in all Modes

Scene Module accepts Panoramas, Objects, Still Images and Linear Movies as Nodes

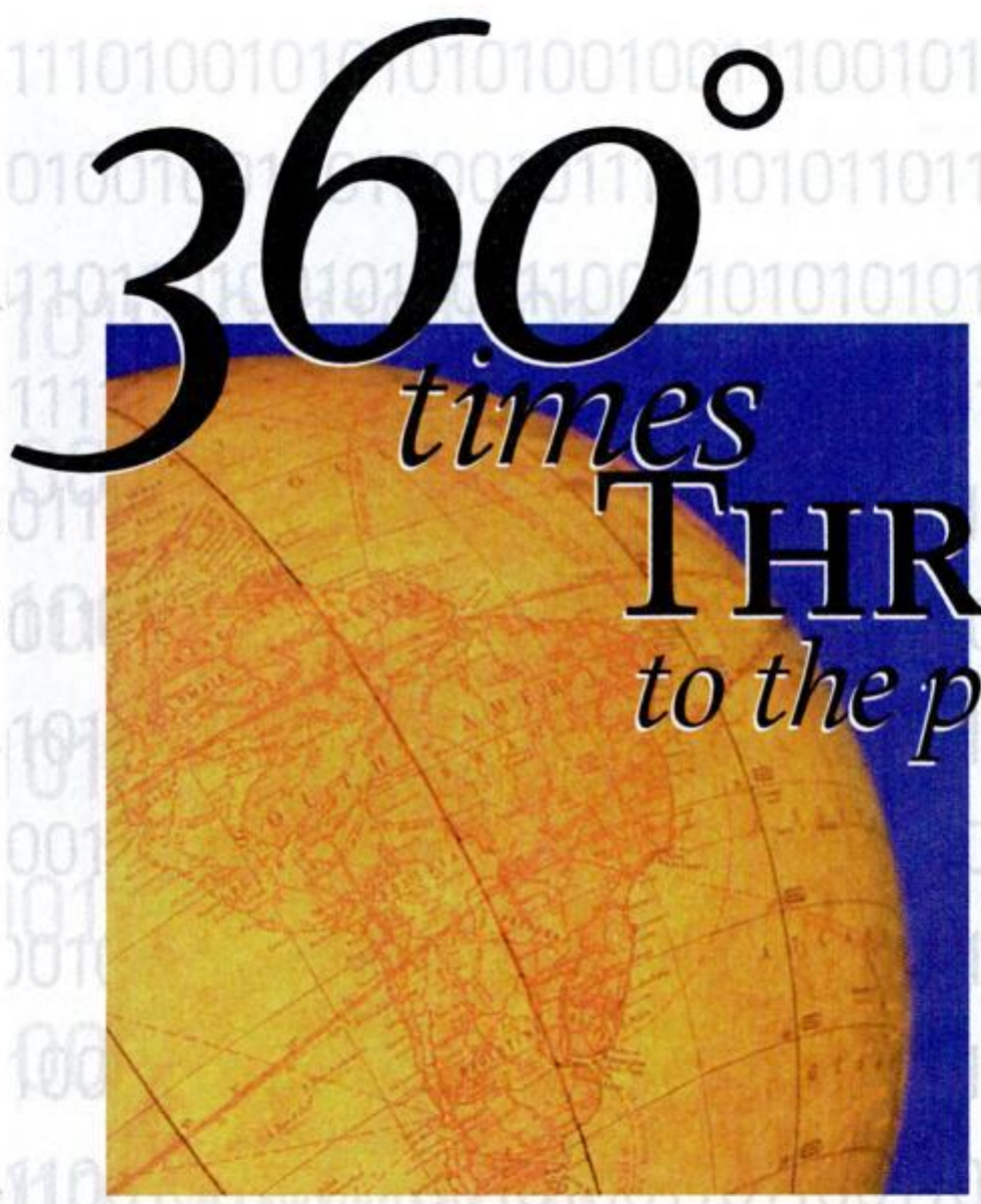
Built-In Support for Mechanized Object Rigs

Edit and Preview Multi-Node Scenes from the program, without first having to render finished movie

Build Panos and Objects from within the Scene Module

Educational QTVR Curriculum

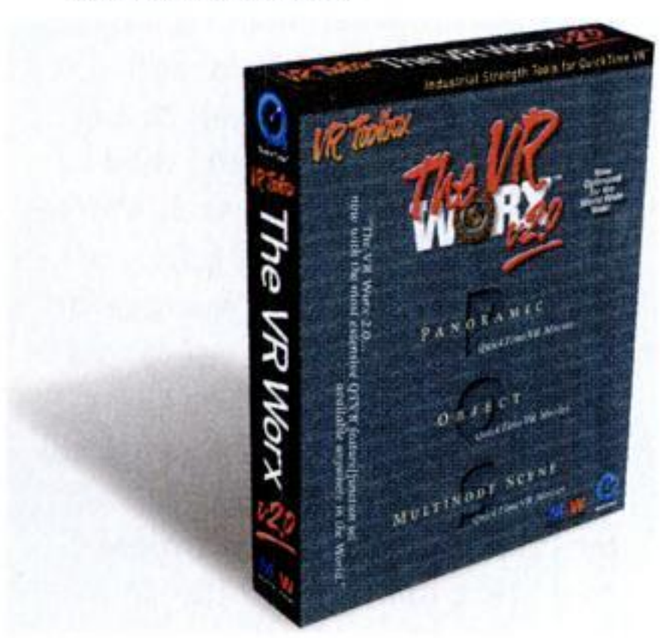
Cross Platform Compatible



The VR Worx 2.0

all the QuickTimeVR the World has to offer...

Optimized for the World Wide Web



1-877-878-6657 TOLL FREE

www.vrtoolbox.com

■ The VR Worx™2.0, the upgrade to the suite of QuickTime VR™ authoring tools from VR Toolbox™. The VR Worx combines all our QTVR™ solutions into a single integrated interface, and creates the ideal tool suite for the user who needs all the QuickTime VR the World has to offer. ■ The VR Worx gives you the ability to generate QTVR Panoramic movies, Object movies and Multi-node Scenes, involving advanced elements that push the QuickTime VR envelope. Built upon QuickTime™ 4 and available for both Macintosh™ and Windows™. ■ The New 2.0 upgrade brings you a feature/function set unparalleled to date. Visit our web site for full-featured demos of all the VR Toolbox products.

for Macintosh & Windows

Upgrades are now available.

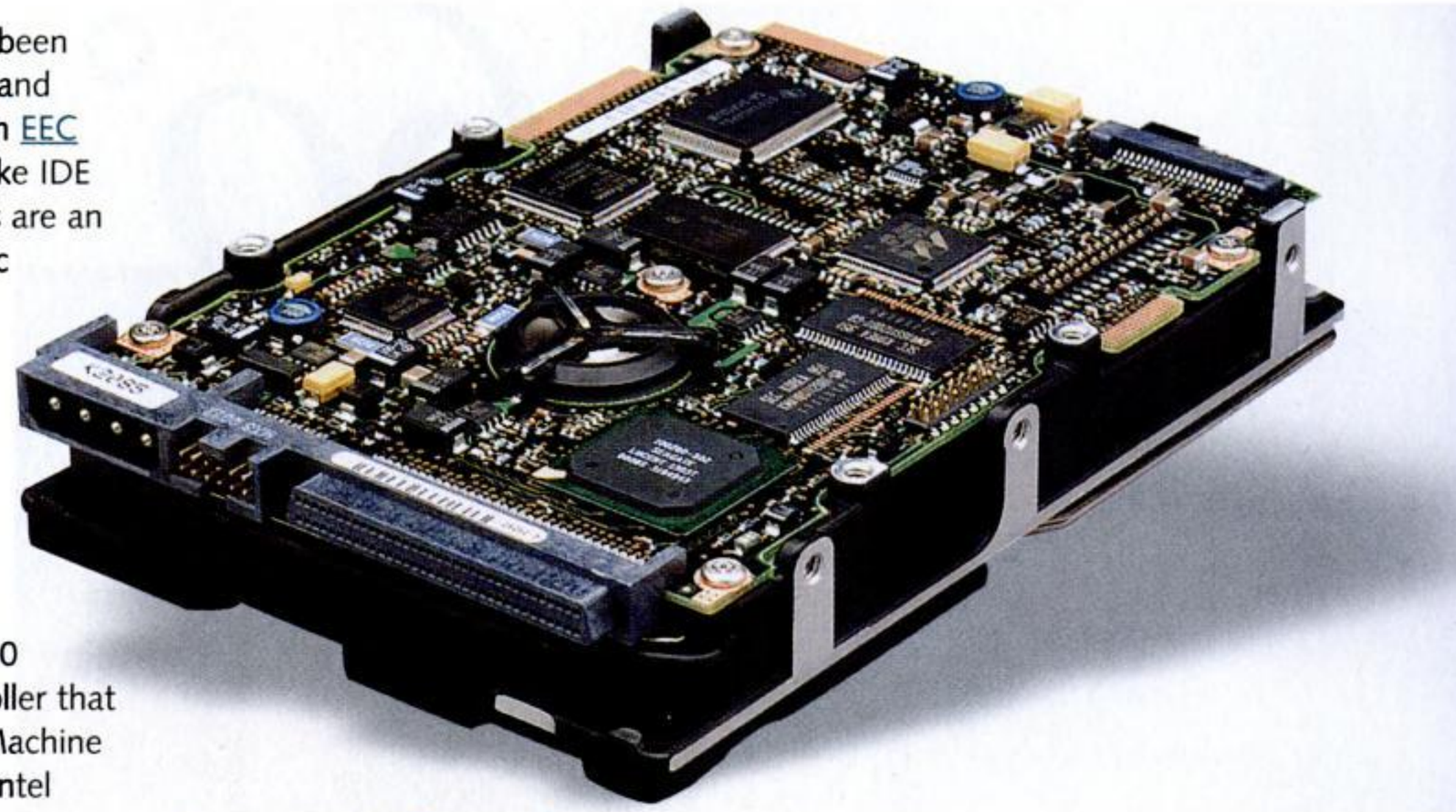
VR Toolbox™
Industrial Strength TOOLS for QuickTime VR™

Copyrighted material

SCSI Drive Standoff

ULTRA160 HARD DRIVES SET NEW LAB RECORDS

For years, speed freaks have been hooked on SCSI hard drives, and for good reason. With built-in EEC and I/O rates that would make IDE drives blush, SCSI hard drives are an admission ticket to the lunatic fringe. This month, we've taken the latest and greatest from Seagate and Quantum out for a spin in our Lab. This round of testing marks our first foray into the realm of Ultra160 SCSI. For benchmarking we used the same Adaptec 39160 dual-channel Ultra160 controller that was included in our Dream Machine (connected of course to the Intel Vancouver motherboard of our official test system). As performance numbers show, these drives are the cream of the crop when it comes to fast data transfers. If you're looking for the fastest prosumer hard drives money can buy, look no further.



Seagate's Cheetah X15 spins at a mind-boggling 15,000rpm, and was chosen as the drive of choice for Dream Machine 2000.

SEAGATE

PLUSES
- 15K spindle speed
- 3.9ms seek time
- Relatively inexpensive

MINUSES
- Not big enough

QUANTUM

PLUSES
- 8MB buffer
- Selection of sizes
- Fastest 10,000rpm SCSI drive

MINUSES
- Slower than X15

Seagate Cheetah X15

Throughout the years, Seagate (**www.seagate.com**) has consistently led the way in hard drive spindle speeds. Its Cheetah 4LP was the first 10,000rpm SCSI drive, and now the X15 raises speed to an ungodly 15,000rpm. By increasing the speed of the shaft that rotates the drive's platters, the platters are able to spin under the drive heads faster, which reduces rotational latency, and improves access times accordingly. Rotational latency is the time it takes for a requested track to spin under the drive head once the head has been positioned over the correct cylinder.

Seagate was able to achieve its spindle speed increase by reducing the size of its platters by approximately half an inch, moving from the traditional 3-inch platter to one measuring 2.6 inches. Reducing platter size allows the platters to spin at a faster rate without generating a prohibitive amount of heat, noise, and vibration. The only downside to platter size reduction is less storage capacity, which is evident in the X15's diminutive 18.4GB capacity when formatted. If you're seeking X15 performance in capacities larger than 18GB, well ... it sucks to be you! Seagate isn't releasing larger capacities! However, we have heard talk of an audio/video editing version of the drive with an exorbitant 16MB buffer. For now, the X15 only comes with a 4MB buffer.

Not surprisingly, the X15 performed exceptionally during testing. Sequential read speeds in *HDTach* were phenomenal, maintaining rates between 35MB/sec and 41MB/sec all the way out to the 13.5GB mark. From there, read rates slowly leveled off to 30MB/sec all the way to the outer edges of the platters, hitting an average of approximately 36MB/sec—a new *Maximum PC* Lab record. There were a few small downward spikes into the 20MB/sec range, but, overall, the read rate was more consistent than that of the Quantum Atlas 10K II.

Access times were also record-breaking, despite the fact that they were almost an entire millisecond

DARE TO COMPARE

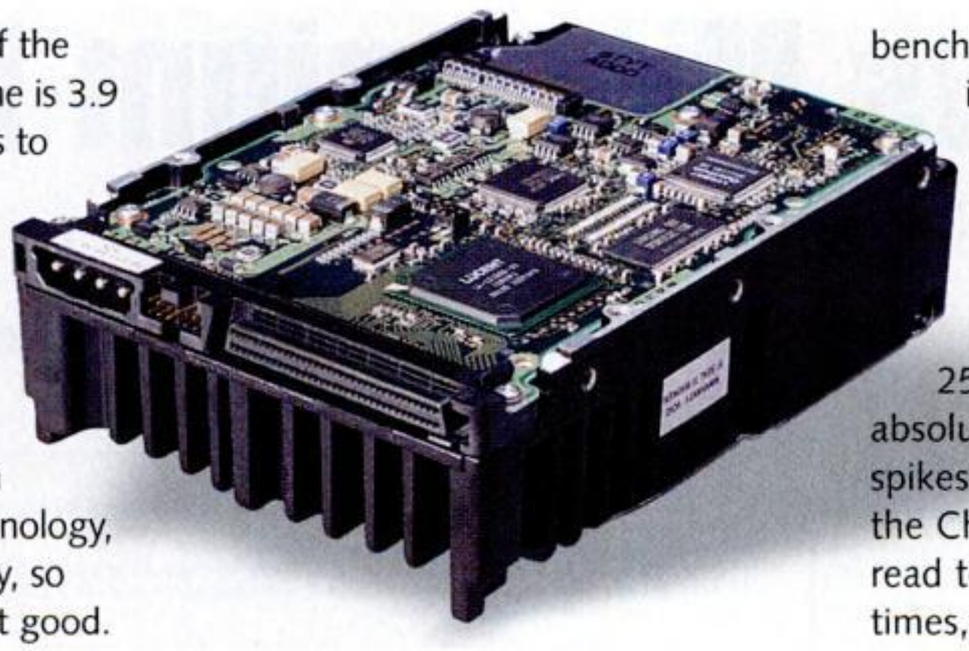
MANUFACTURER	SEAGATE X15		QUANTUM ATLAS 10K II	
HD TACH	**WIN98**	**WIN2K**	**WIN98**	**WIN2K**
Average read speed (MB/sec)	35.78	35.95	30.71	30.44
Random access times (ms)	6.6	6.7	8.5	8.4
Read burst speed (MB/sec)	80	77.2	88	86.5
CPU utilization (%)	6.9	7.8	8.6	7.0
INTEL IOMETER				
Random access (tps)	n/a	141	n/a	111
Read speed (MB/sec)	n/a	33.20	n/a	31.99
REAL WORLD BENCHMARKING				
Time to copy 644MB (min:sec)	1:46	1:50	0:53	1:13

All tests were performed with an Adaptec 39160 dual channel Ultra160 SCSI adapter. Intel Iometer does not run on Win98.

Copyrighted material

over the advertised ability of the drive. Its advertised seek time is 3.9 seconds. When you add this to the drive's average rotational latency of 2ms, you should get an average access time of 5.9 milliseconds. We, however, recorded an average access time of 6.6ms. When dealing with hard drive technology, one millisecond is an eternity, so being 0.7ms over spec is not good. Still, it's the fastest access time available, so we won't get our boxers in too much of a bundle.

The drive's only real compromise is its relatively small storage capacity—18.4GB is just a tad puny for most power users. The X15 is also a bit pricey, but if you want the crème de la crème of hard drive performance, this is it.



Quantum's Atlas 10K II offers the speed of 10,000rpm Ultra160 SCSI and is 73.4GB to boot. What's not to love (other than the pricetag)?

Quantum Atlas 10K II

If you desire rip-roaring SCSI transfer rates, but the X15 is too small for your "multimedia" file collection, the Quantum Atlas 10K II (**www.quantum.com**) is the answer to your prayers. Its performance under most workloads is slightly slower than the X15's, but it's still the fastest 10,000rpm SCSI drive we've ever tested.

Although the Atlas 10K II can't be expected to spank the faster-spinning Seagate, it does have an advantage in three important categories: areal density, buffer size, and platter configurations. Areal density refers to how much data can be crammed onto one square inch of platter, and the Atlas 10K II is the class leader at 7.7GB per square inch.

Since the platters that are used to hold data don't usually increase in size from generation to generation, storage capacities are made greater through increased areal density, as well as faster sequential transfer rates.

The second advantage of the Atlas 10K II is its 8MB buffer, which is twice the size of the Cheetah and four times the size of any other Ultra2 SCSI. A large onboard buffer (a.k.a. cache) results in improved performance when streaming data to or from the hard drive, or when working with large multimedia files.

Finally, the biggest advantage this drive has over the Seagate is that it comes in a variety of sizes, ranging from a svelte 9GB to a plump 73.4GB. The only performance-related difference among the various sizes is that the smaller drives offer a seek time of 4.7ms, while the larger 73.4GB model is a hair slower at 5.2ms.

During testing, the Atlas 10K II's benchmark scores were slightly inferior to the X15's, but impressive nonetheless. Sequential read speeds reported by *HDTach* were in line with Quantum's claims, ranging between 25MB/sec and 41MB/sec with absolutely no large downward data spikes. The Atlas was trounced by the Cheetah drive in sequential read tests and random access times, which we expected, given its spindle speed disadvantage. But the Atlas smoked the Cheetah in read burst tests and real-world write times, thanks to its larger areal density and 8MB of cache.

Read performance was phenomenal in Win98, but we saw a few nasty downward spikes in Win2000, including one at 5GB that momentarily dropped read speeds to 5MB/sec. Overall, the Quantum's read performance fluctuated more than the Cheetah's, but not wildly enough to cause concern.

We usually assign Good Guy, Bad Guy roles in a head-to-head shootout, but the truth is, both of these drives represent the pinnacle of SCSI hard drive development. The Seagate Cheetah certainly triumphs over the Atlas 10K II drive in most benchmarks, but remember that the Atlas drive was announced in early 2000, while the Seagate drive was just hitting the market as of this writing (mid-August).

Both of these drives are kick-ass, but the question of which one is better for you (or your business) comes down to how much money you have and how much storage space you need. Folks who are into the latest trend of peer-to-peer file trading may want to stick with a larger hard drive, for obvious reasons, but with either of these drives, you can't lose.

—Josh Norem

THE SPECS

MANUFACTURER	SEAGATE	QUANTUM
Drive name	Cheetah X15	Atlas 10K II
Drive model	ST318451LW	QM336400TY-LW
Available capacities (GB)	18.4	9.2/18.4/36.7/73.4
Buffer size (MB)	4	8
Number of discs/heads	5/10	10/20
Gigabytes per platter (GB)	3.68	7.3
Areal density (GB/square inch)	7.5	7.7
Rotational speed (RPM)	15,000	10,000
Claimed read seek time (ms)	3.9	*4.7

*This is the seek time claimed for every drive in the family, except the 73.4GB model reviewed here, which has an advertised seek time of 5.2ms.

SEAGATE CHEETAH X15 9

$620 | Seagate
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1028

QUANTUM ATLAS 10K II 9

$1,650 (for 73.4GB model)
Quantum
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1027

Copyrighted material

Windows Millennium Edition

NOT MUCH MORE THAN A WIN98 REFRESH

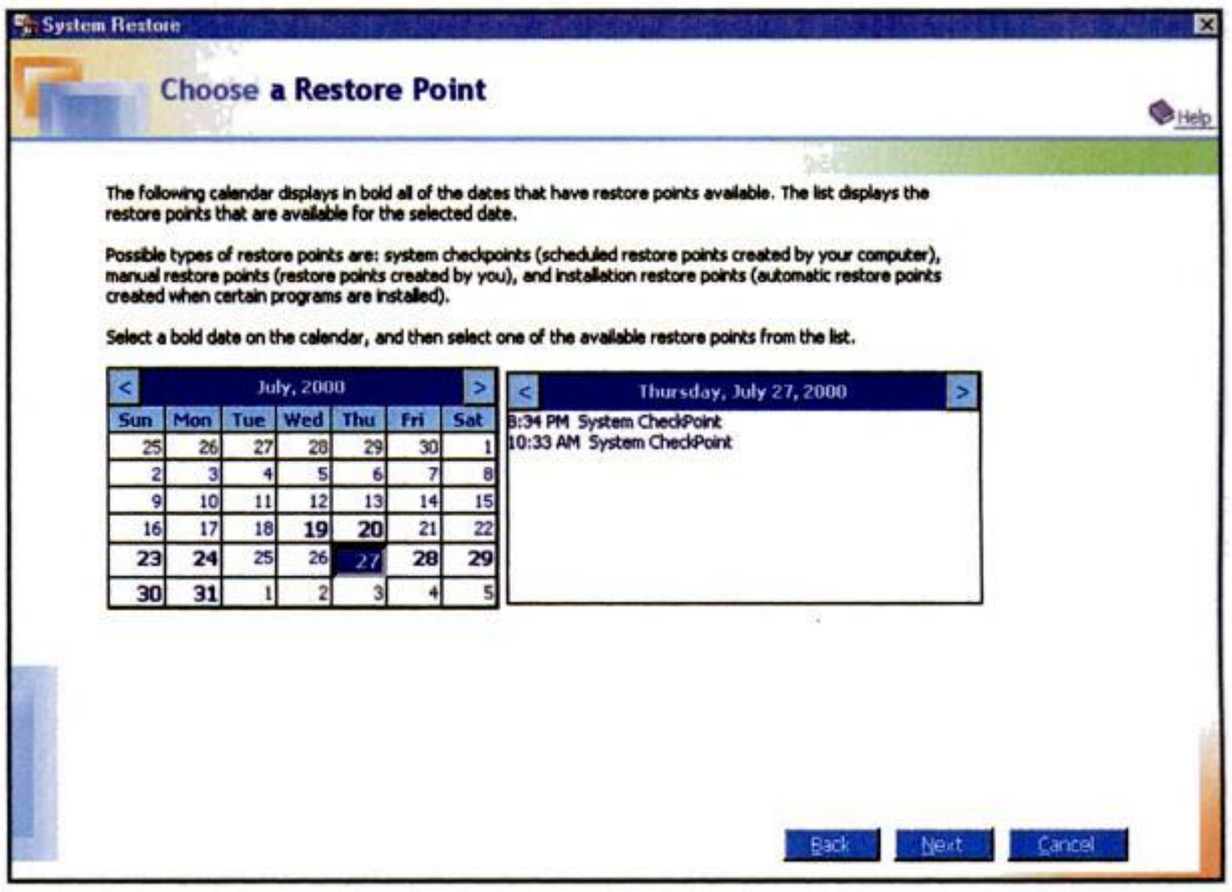
In our review of Windows 98, we wrote, "With no earth-shattering new features, the latest revision of Windows sells itself merely as a spit-shined version of [its predecessor]." Well, the same can be said of the Millennium Edition (**www.microsoft.com/windowsme/**). Most of the enhancements in WinME are behind the scenes, designed to improve the experience of the mythical "average" user. For the power user, there's nothing so compelling about ME that you need to rush out and buy the OS before building or buying your next system.

PLUSES
- Easier to use than Win98
- Almost impossible to break
- Movie Maker
- Better hardware support

MINUSES
- No new interface changes
- No faster than Win98

The most notable addition in WinME is Microsoft Movie Maker, which facilitates rudimentary video capture and editing. Through extensive testing, we found Movie Maker to be considerably easier to use than commercially available products, though not as powerful. However, while Movie Maker lacks a number of features found in competing products, it does excel at compression. In fact, there isn't much else on the market that compares to the fantastic image quality and great compression ratios of Microsoft's new WMV format. Movie Maker supports everything from FireWire to newer USB-based analog video capture devices. The only downside is that Media Player 7 is required to play any files created with Movie Maker.

Also new to the Windows family is a built-in System Restore tool. It's basically a lite version of commercial products such as *GoBack*, which make periodic backups of your system's vital innards (called Restore Points) at least every 24 hours. The Restore Points allow you to restore a previous configuration should you bork your system. Unlike commercial programs, the System Restore tool only backs up vital system files, leaving your My Documents folder unprotected. This is both good and bad. The good news is that if you need to restore your system and don't want to write over all the documents you've created, you'll be just fine. The bad news is that the tool doesn't back up these very documents, so if you *really* bork your system, your precious personal data might be lost.

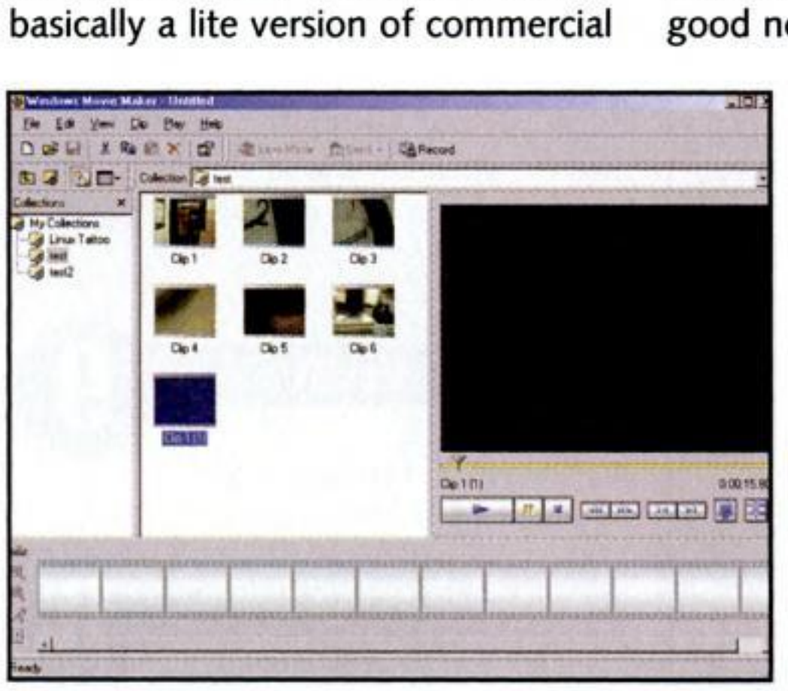

System Restore
Choose a Restore Point
Help
The following calendar displays in bold all of the dates that have restore points available. The list displays the restore points that are available for the selected date.
Possible types of restore points are: system checkpoints (scheduled restore points created by your computer), manual restore points (restore points created by you), and installation restore points (automatic restore points created when certain programs are installed).
Select a bold date on the calendar, and then select one of the available restore points from the list.
July, 2000
Sun Mon Tue Wed Thu Fri Sat
25 26 27 28 29 30 1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31 1 2 3 4 5
Thursday, July 27, 2000
8:34 PM System CheckPoint
10:33 AM System CheckPoint
Back
Next
Cancel

If you like to break your computer, you'll love the System Restore tool. Unfortunately, it's still not a replacement for the occasional re-format.

The bulk of changes found in WinME are intended to help people without much computing experience. One of these helping hands is the Windows Imaging Acquisition (WIA) interface, which supplants the archaic TWAIN interface. With built-in support for most popular digital cameras and scanners, WIA provides unified image acquisition software, making the My Photos directory a one-stop shop for basic imaging needs.

By simplifying error messages, providing a universal Help database, and offering tighter integration with digital cameras and scanners, WinME removes many of the hurdles faced by novice computer users. Unfortunately, though, there isn't much in ME for power users. Sure, by finally removing real-mode DOS support, integrating the Windows 2000 TCP/IP stack, and including updated drivers for modern chipsets and motherboards, Windows ME might *tempt* power users, but the new OS doesn't improve boot times or benchmarks. We recommend that you wait for ME until your next new system purchase. If you do plan to purchase ME, make sure you pick it up before the introductory upgrade price of $59.99 expires on January 15, 2001.

—Will Smith



It doesn't provide the functionality of boxed video editors, but Movie Maker makes e-mailing video postcards to grandma really easy.

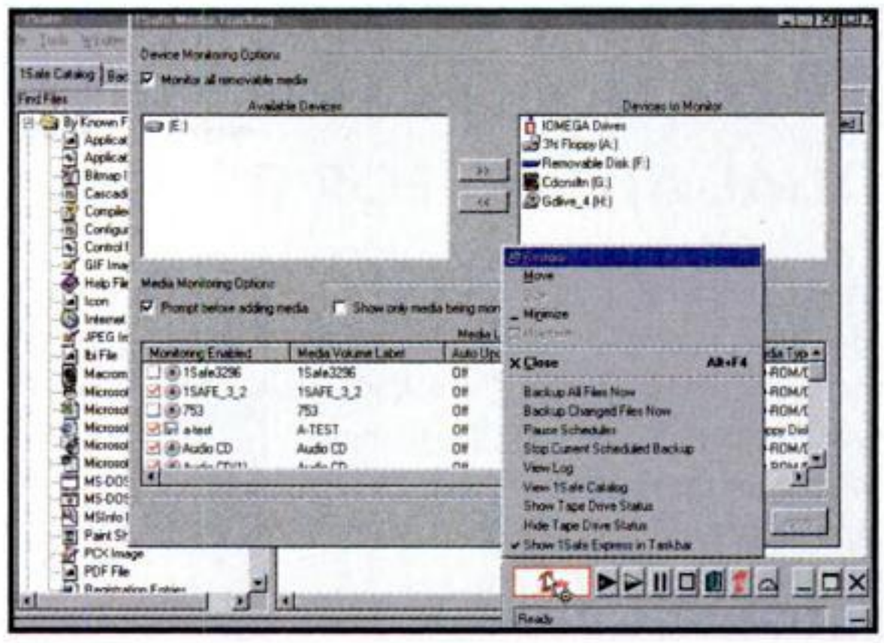
MAXIMUM PC VERDICT 6

$60 upgrade | $209 full
Microsoft
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1029

Copyrighted material

1Safe Backup

ORGANIZE, SCHMORGANIZE...



1Safe's "virtual drive" database lets you quickly retrieve files stored on all of your removable media.

1Vision's *1Safe* (**www.the1vision.com**) is a data cataloger and file-backup utility that can help you make sense of your unmarked media and perform rudimentary backups. While the utility helped us determine which disks contained what files, its dodgy hardware support left us frustrated.

The data-cataloging portion of *1Safe* is the best part of the program. Each time you insert a CD, removable cartridge, or floppy disk into your computer, the contents are indexed and added to a virtual drive. The beauty of this scheme is that you can peruse the contents of your removable media even after you've ejected the disks and thrown them in a pile on top of your case.

So far, so good. But the *1Safe* backup module is less impressive. You can designate any drives, folders, or files on your computer for backup, but during testing *1Safe* failed to see our Conner CT8000 Travan Drive—which just so happens to be on the list of supported tape drives supplied to us by *1Safe*'s tech support manager.

Allegedly, *1Safe* is also able to back up CD-R and CD-RW media if you've preinstalled Adaptec's *DirectCD*, but the program wouldn't work on our Ricoh MP6200S CD-R drive. For media that it can deal with, *1Safe* has a sophisticated Backup Scheduler that permits monthly, weekly, daily, hourly, or "by-the-minute" backups.

As much as we like *1Safe*'s "virtual drive" cataloger/retriever feature, we have to say that Dantz's *Retrospect Express* (reviewed in July 2000) gives you more backup power and stability. And if you're just looking for a media cataloger, you can probably find a less-expensive shareware package.

—Lenny Bailes

PLUSES
- Handy catalog feature
- Sophisticated backup scheduler

MINUSES
- Limited support for TR4/TR5 tape devices
- Requires third-party software to back up CD-R/CD-RW drives

MAXIMUM PC VERDICT 6

$70 | 1Vision
Buy www.SeeMeBuyMe.com | 877.751.7467 | ID#1030

DIGITAL FlipBrowser

World's First e-Book Browser

- BROWSES INTERNET WITH A BOOK-INTERFACE
- ALL WEB-PAGES SEEN ARE RETAINED IN BOOK
- BOOKMARKING FOR QUICK ACCESS TO PREVIOUS WEB-PAGES
- OPEN ONLINE E-BOOKS ON THE WEB
- WORKS LIKE AN E-BOOK
- PLAYS AND ORGANIZES MP3 FILES

Order
My Wedding Day
A beautiful memory to be remembered and shared with others
FlipAlbum.com - the site for the
FlipAlbum™ Suite

E-BOOK SYSTEMS

Free Download at
www.flipbrowser.com/m12

Copyrighted material

Heavy Metal: F.A.K.K.2

RITUAL ATONES FOR ITS PAST SINS

It takes a real geek to look at a third-person action/adventure game such as *Heavy Metal: F.A.K.K.2* (**www.godgames.com**) and think the modeling and textures are more beautiful than the game's buxom heroine. But it's true. *F.A.K.K.2* is flat-out the most gorgeous game we've ever played, and its half-naked heroine represents a large technological step forward, even if her provocative clothing sets the women's movement back a few years.

To alleviate confusion right from the giddy-up, *F.A.K.K.2* is based on the comic book world of *Heavy Metal*. In that world, the term F.A.K.K.2 stands for "Federation Assigned Ketogenic Killzone to the Second Order." In other words, an extreme biohazard. F.A.K.K.2 is also the nickname of the story's protagonist, Julie. Any semblance of a plot, however, takes a backseat to the stunning beauty that the folks at Ritual Entertainment have coaxed out of the *Quake III* engine.

PLUSES
- Incredible graphics
- Slick animation
- Plenty of bloodshed

MINUSES
- No multiplayer
- Annoying insect enemies

THE SPECS

3D CARD SUPPORT	OpenGL
3D AUDIO SUPPORT	EAX, DirectSound, A3D
MULTIPLAYER	None
TOTAL PLAYERS	One

The *Quake III* engine is easy on the eyes to begin with, but Ritual saw fit to add generous heapings of technological innovation to John Carmack's brainchild. Perhaps the most ambitious addition is the use of skeletal animation, which lends a truly life-like quality to character models. This technology—first popularized in *Half-Life*—is quite different from its predecessor, keyframe animation.

In keeping with gaming tradition, the main character wears a thong bikini while attempting to save the world from certain destruction.

***F.A.K.K.2* takes third-person gaming, and the *Quake III* engine, to the next level.**

When building a keyframe animation of, say, a character raising its arm, the animator must manually manipulate large groups of polygons (called meshes), frame by frame, until the arm reaches its final position. Each mesh contains thousands of vertices, all of which have to be recalculated in concert.

With skeletal animation, models are created with "intelligent" bones and joints that govern the movement of vertices attached to them. For example, a character's elbow joint will be programmed with information that describes how elbow joints behave in real life, and how they affect the movement of forearm bones and muscles. So, if a model extends its arm, the elbow mesh helps reform the meshes that comprise the rest of the arm, and the entire limb moves with more life-like motion.

Because this technology frees animators from laboriously manipulating individual vertices, they can shift their efforts to building more complex models. To this end, Ritual endowed Julie with more than 8,000 frames of animation, resulting in movements and gestures that are eerily realistic.

The game also shines with copious amounts of procedurally generated textures. They're used to create awesome fire, smoke, blood, and gas cloud effects. Everything from the flames dripping off of Julie's fire sword to the blood gushing out of the necks of beheaded corpses looks incredibly realistic (although we're only guessing on the decapitations, honest).

As a single-player game, *F.A.K.K.2* takes a while to get going, but once it does, it offers almost nonstop action. The dual-fisted combat system allows for some interesting combinations, but we hated the *Daikatana*-ish flying bugs that plagued us throughout the first few levels. Overall, it's a fast-paced game that's over unfortunately soon; we finished the game in just a few days.

Owners of wimpy PCs may shy away from this title, due to its outlandish graphics, but take it from us: If you've been looking for a reason to upgrade your system, *F.A.K.K.2* is as good as any. As a savvy adaptation of the *Quake III* engine, it is a technological triumph.

—Josh Norem

MAXIMUM PC VERDICT 9

$40 | Ritual Entertainment
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1031

For definitions of Terminator words, check out the Terminator online at www.maximumpc.com.

Copyrighted material

KISS Psycho Circus

OLD-SCHOOL FORMULA IS FUN YET FLAWED

Midway through the development of *Daikatana*—the *Ishtar* of gaming—eight disgruntled staff members walked out on John Romero to form their own game development company, Third Law Interactive. The team's debut game, *KISS Psycho Circus: The Nightmare Child* (**www.kisspsychocircus.com**), is an admirable first effort, but it ultimately falls short of being anything more than a mindless first-person killing spree.

The game is based on the *KISS* comics by Todd McFarlane, which portray the four members of the legendary rock band as superheroes. In the game, you don't actually play as members of KISS, but as four guys who must travel to a "Psycho Circus" in order to form a sort of rock 'n' roll allegiance and destroy a "Nightmare Child." Uh-huh. Along the way, the four characters increase their powers by picking up relics that look like KISS stage clothes. For instance, you can use the knee-high metal boots with 4-inch spikes to gain greater jumping ability. It's silly, but the plot actually takes a back seat to the one thing this game has in spades—wall-to-wall action.

Enemies don't appear in groups, they turn up in droves. Spawning machines pop out monsters throughout the game, and there are times when groups of baddies teleport in from thin air. This requires almost no AI of course, but the ludicrous number of enemies helps create a frantic, arcade-type feel that's been absent from PC titles since *Doom*.

***KISS Psycho Circus: The Nightmare Child* is a lot like the frantic shooters of yore, but that's not necessarily a good thing.**

The "smooth as buttah" Lithtech 1.5 engine, which sacrifices visual beauty for continuous killer frame rates, makes possible the presence of so many enemies onscreen. Even when the screen was replete with bad guys, gunfire, smoke, and splattering blood, frame rates never took a dive on our P-III 733MHz test system. The aging Lithtech engine isn't capable of the visual feats afforded by the *Quake III* or *Unreal Tournament* engines, but it still offers all of the usual suspects, including environment maps, realistic fogging effects, and the most stunning mirrors to ever appear in a PC game. Unfortunately, 32-bit color support is not included, and it shows in the nasty dithering that plagues weapon models and world textures.

Player control is precise, and when you factor in the high degree of maneuverability in the air, *Psycho Circus* would seem to have the elements of a multiplayer masterpiece. But unfortunately, the game's a letdown. Our first complaint is that there's no in-game server browser, meaning players must manually enter an I.P. address to join a server. We haven't had to do this since *Quake II*, fer chrissakes. Our next beef is that the game only offers four multiplayer maps and two game types—both based on deathmatch. Some gamers are nostalgic for *Doom*-type games, but they shouldn't have to forfeit features considered de facto in today's first-person shooters, such as team-oriented game types and in-game server browsers. Come on, Third Law, get with the times.

Fans of rapid-fire, all-guns-blazing shooters will surely relish *Psycho Circus'* return to the roots of the first-person shooter genre. But its antiquated technology and game play are too simplistic to garner accolades.

—Josh Norem

PLUSES
- Nonstop action
- Smooth frame rates
- Interesting enemies

MINUSES
- One-dimensional game play
- Only four multiplayer maps
- No in-game server browser
- 16-bit color

THE SPECS

3D CARD SUPPORT
Direct3D

3D AUDIO SUPPORT
DirectSound

MULTIPLAYER
TCP/IP | LAN

NUMBER OF PLAYERS
8

Why, who's that on the wall? Not surprisingly, the game **is full of KISS tributes such as this picture of guitarist Paul Stanley.**

MAXIMUM PC VERDICT 7

$40 | Third Law Interactive
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1032

Copyrighted material

Icewind Dale

LIKE DIABLO II, ADDICTIVE YET DISAPPOINTING

Last month, we criticized *Diablo II* for being long on click-click-click gameplay and short on innovation. This month, we found the same to be true of *Icewind Dale* (**www.interplay.com**). This RPG is incredibly similar to its predecessor, *Baldur's Gate*, leading us to believe that the developers were playing it safe when they drafted the *Icewind Dale* design document.

The graphics and spell effects in *Icewind Dale* are middling, just like every other aspect of the game.

Icewind Dale takes place in, appropriately enough, a land known as Icewind Dale. This snow-swept region of the Advanced D&D "Forgotten Realms" world is plagued by an unknown evil that only the player and his party can root out and eradicate.

Unlike *Baldur's Gate*, where you meet up with five allies over the course of the game, *Icewind Dale* allows you to create a party of six characters at the start. The party creation can take a while because it involves choosing each member's skills, appearance, character portrait, etc., based on the Advanced D&D system and rule set. Still, it's fun to have a band of characters entirely of your own making to hang out with throughout the game. The development of your characters' powers and abilities is slow going at first, but since the gameplay is more combat-intensive than *Baldur's Gate*, you'll soon find your characters evolving into kick-ass warriors stocked with weapons of unimaginable strength.

Although the game is driven by a well-developed series of key plot points, gameplay is nothing more than fighting, fighting, and more fighting. With all the killing, frequent saving isn't just a good idea, it's a necessity. Unfortunately, *Icewind Dale* lacks a Quicksave, and the Save/Load interface is absurdly tedious and slow.

Technically, *Icewind Dale* is not a breakthrough title in any regard. The graphics are created with the aging Infinity engine, which is software-based. That's right, this is *not* a 3D-accelerated title! In fact, most of the character images are sprites lifted right out of *Baldur's Gate* and placed on completely static, though extremely detailed backgrounds. Although not required, support for OpenGL is included, yet all this does is smooth out dithering in the fog-of-war effect and enhance the lighting used in certain spells. Even the difference between 32-bit and 16-bit color is scarcely noticeable in most areas of the game. On a positive note, multiplayer support is superb, and cooperative play is available for two to six players.

Aside from the substandard graphics, the game's most glaring flaw is the horrific AI pathfinding that guides characters around the game world. Although your troops maneuver much more quickly than they did in *Baldur's Gate*, they seem to be distinctly less intelligent in choosing their routes. Often, one or more of your fellow travelers will head off to the far corner of the map while the rest of your party reaches its destination just fine. Even worse, this sort of thing happens frequently in combat, where one wayward character's wanderings can accidentally "activate" numerous monsters that you aren't quite prepared to fight all at once.

With its intense action and addictive gameplay, *Icewind Dale* delivers what RPG fanatics crave. We would, however, have appreciated some technological innovation.

—Michael E. Ryan

PLUSES
- Great hack-and-slash action
- High-level character development

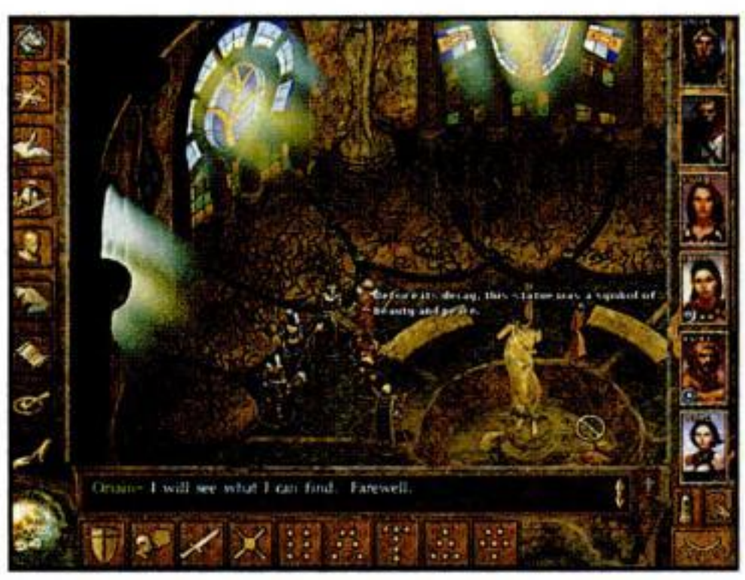
MINUSES
- AI pathfinding is atrocious
- Saving/loading games takes too damn long
- Outdated graphics

THE SPECS

3D CARD SUPPORT
None; OpenGL support optional (but not officially supported)

3D SOUND SUPPORT
EAX

MULTIPLAYER
2- to 6-player cooperative mode (IPX, IP, modem, serial)



Spotting these three huge traps is an easy task for even a mildly skilled rogue.

MAXIMUM PC VERDICT 6

$48 | Interplay
Buy www.SeeMeBuyMe.com
877.751.7467 | ID#1033

Copyrighted material

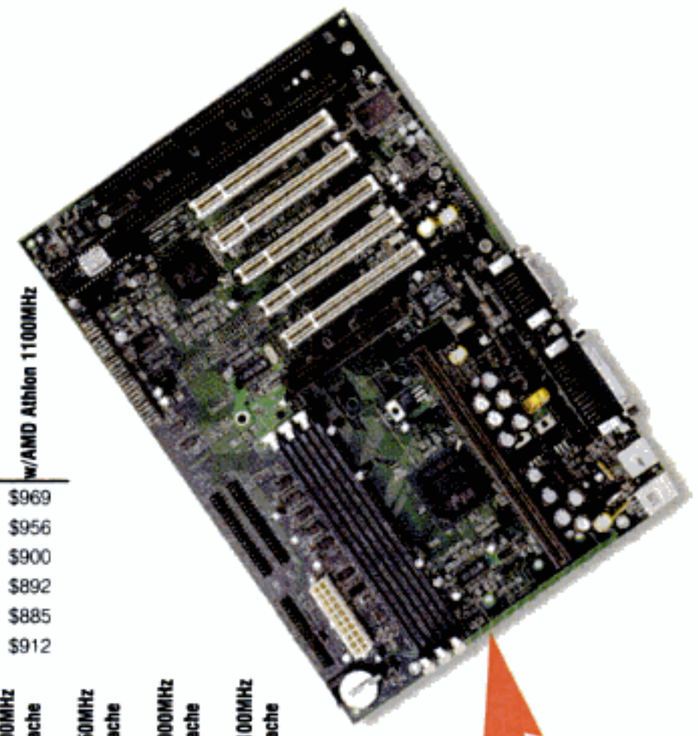
The Straight Talk People℠
SINCE 1991

ABERDEEN 1

MOTHERBOARD GEEK HEAVEN!

Super7™

	Part Number	Chip Set	L2 Cache (KB)	Maximum Memory (MB)	168-pin DIMM Sockets	72-pin SIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD-K6®-2/500	w/AMD-K6-2/550	w/Intel® Pentium® MMX™ 233MHz
EPoX EP-MVP3C2	MB5406	VIA Apollo MVP3	512	384	3		Award		UltraDMA/66	4	2	1	Baby AT	2 Yrs	$85	$144	$170	$145
EPoX EP-MVP3G5	MB5405	VIA Apollo MVP3	2048	384	3		Award		UltraDMA/66	5	2	1	ATX	2 Yrs	$110	$169	$195	$170
FIC VA-503+	MB5211	VIA Apollo MVP3	1024	512	2	4	Award			3	3	1	Baby AT	1 Yr.	$76	$135	$161	$136
Pine VA7-AV	MB5300	VIA Apollo MVP4	512	768	3		Award	AC-97	UltraDMA/66	5	2		ATX	3 Yrs.	$93	$152	$178	$153
Shuttle HOT-591P	MB5611	VIA Apollo MVP3	512	256	2	2	Award			3	3	1	Baby AT	1 Yr.	$80	$139	$165	$140
Tyan S1590S Trinity 100AT	MB5006	VIA Apollo MVP3	1024	384	3	2	Award			4	4	1	Mini AT	3 Yrs.	$99	$158	$184	$159



Slot A

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Bus Frequency	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD Athlon™ 750MHz	w/AMD Athlon 800MHz	w/AMD Athlon 850MHz	w/AMD Athlon 900MHz	w/AMD Athlon 950MHz	w/AMD Athlon 1000MHz	w/AMD Athlon 1100MHz
ABIT KA7-100	MB7502	VIA Apollo KX133	2048	4	Award	200/133	UltraDMA/100	6	1	1	ATX	1 Yr.	$189	$384	$409	$474	$514	$614	$759	$969
Asus K7V	MB7703	VIA Apollo KX133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr	$176	$371	$396	$461	$501	$601	$746	$956
EPoX EP-7KXA	MB7850	VIA Apollo KX133	768	3	Award	200/133	UltraDMA/66	5	1	1	ATX	2 Yrs.	$120	$315	$340	$405	$445	$545	$690	$900
FIC SD11	MB7401	AMD-751 / VIA 686A	768	3	Award	100	UltraDMA/66	5	1	1	ATX	1 Yr.	$112	$307	$332	$397	$437	$537	$682	$892
Shuttle AI61	MB7901	AMD-750	768	3	Award	100	UltraDMA/66	5		1	MicroATX	1 Yr.	$105	$300	$325	$390	$430	$530	$675	$885
Tyan S2380 Trinity K7	MB7000	VIA Apollo KX133	768	3	Award	200/133	UltraDMA/66	6	1	1	ATX	3 Yrs.	$132	$327	$352	$417	$457	$557	$702	$912

Socket A

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Bus Frequency	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/AMD Duron™ 600MHz	w/AMD Duron 650MHz	w/AMD Duron 700MHz	w/AMD Duron 750MHz	w/AMD Athlon™ 750MHz with Enhanced Cache	w/AMD Athlon 800MHz with Enhanced Cache	w/AMD Athlon 850MHz with Enhanced Cache	w/AMD Athlon 900MHz with Enhanced Cache	w/AMD Athlon 950MHz with Enhanced Cache	w/AMD Athlon 1000MHz with Enhanced Cache	w/AMD Athlon 1100MHz with Enhanced Cache
ABIT KTV	MB7503	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	6	1	1	ATX	1 Yr	$169	$252	$269	$299	$344	$364	$389	$454	$494	$594	$739	$949
ABIT KTV-RAID	MB7504	VIA Apollo KT133	1536	3	Award	200/133	DMA/100 RAID	6	1	1	ATX	1 Yr	$199	$282	$299	$329	$374	$394	$419	$484	$524	$624	$769	$979
ASUS A7V	MB7704	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/100	5		1	ATX	1 Yr	$173	$256	$273	$303	$348	$368	$393	$458	$498	$598	$743	$953
EPoX EP-8KTA	MB7851	VIA Apollo KT133	768	3	Award	200/133	UltraDMA/66	6	1	1	ATX	2 Yr	$157	$240	$257	$287	$332	$352	$377	$442	$482	$582	$727	$937
FIC AZ11	MB7402	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr.	$144	$227	$244	$274	$319	$339	$364	$429	$469	$569	$714	$924
Microstar K7T Pro	MB7203	VIA Apollo KT133	1536	3	Award	200/133	UltraDMA/66	5		1	ATX	1 Yr.	$159	$242	$259	$289	$334	$354	$379	$444	$484	$584	$729	$939

Slot 1

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	168-pin RIMM Sockets	Flash BIOS	Integrated Audio	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium III® 600/B 512K 100/133MHz FSB	w/Intel Pentium III 700 256K OD 100MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 750 256K OD 100MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 850 256K OD 100MHz FSB	w/Intel Pentium III 933 256K OD 133MHz FSB	w/Intel Pentium III 1000 256K OD 133MHz FSB	w/Dual Intel Pentium III 600 512K 100MHz FSB	w/Dual Intel Pentium III 850 256K OD 100MHz FSB
ABIT BE6-II	MB6508	Intel 440BX	768	3		Award		UltraDMA/66	5	1	1	ATX	1 Yr.	$141	$341	$376	N/A	$431	$446	N/A	N/A	N/A	N/A	N/A
ABIT BX133-RAID	MB6513	Intel 440BX	768	3		Award		DMA/100 RAID	5	1	1	ATX	1 Yr.	$199	$399	$434	N/A	$489	$504	N/A	N/A	N/A	N/A	N/A
ABIT VT6X4	MB6510	VIA Apollo Pro 133A	768	3		Award	AC-97	UltraDMA/66	5	2	1	ATX	1 Yr.	$105	$305	$340	$340	$395	$410	$525	$715	$925	N/A	N/A
ASUS P2B-DS (Dual)	MB6707	Intel 440BX	1024	4		Award			4	2	1	ATX	1 Yr.	$512	$712	$747	N/A	$802	$817	N/A	N/A	N/A	$912	$1352
ASUS P3B-F	MB6720	Intel 440BX	1024	4		Award			6	1	1	ATX	1 Yr.	$141	$341	$376	N/A	$431	$446	N/A	N/A	N/A	N/A	N/A
ASUS P3V4X	MB6723	VIA Apollo Pro 133A	1024	4		Award		UltraDMA/66	6	1	1	ATX	1 Yr	$130	$330	$365	$365	$420	$435	$550	$740	$950	N/A	N/A
EPoX EP-6VBA2	MB6855	VIA Apollo Pro 133A	768	3		Award	AC-97	UltraDMA/66	4	2	1	ATX	2 Yrs	$105	$305	$340	$340	$395	$410	$525	$715	$925	N/A	N/A
Intel L440GX+ (Dual)	MB6917	Intel 440GX	2048	4		Intel/Phoenix		Adaptec 2-Ch U2W	6	1		ATX	3 Yrs.	$561	$761	$796	N/A	$851	$866	N/A	N/A	N/A	$961	$1401
Intel SE440BX-2 "Seattle"	MB6921	Intel 440BX	768	3		Intel/Phoenix			4	2	1	ATX	3 Yrs.	$120	$320	$355	N/A	$410	$425	N/A	N/A	N/A	N/A	N/A
Shuttle AV64	MB6309	VIA Apollo Pro 133A	768	3		Award		UltraDMA/66	5	2	1	ATX	1 Yr.	$96	$296	$331	$331	$386	$401	$516	$706	$916	N/A	N/A
SuperMicro P6DGU (Dual)	MB6122	Intel 440GX	2048	4		AMI		Adaptec U2W	5	2	1	ATX	1 Yr.	$485	$685	$720	N/A	$775	$790	N/A	N/A	N/A	$885	$1325
SuperMicro P6SBA	MB6120	Intel 440BX	768	3		AMI			4	3	1	ATX	1 Yr	$103	$303	$338	N/A	$393	$408	N/A	N/A	N/A	N/A	N/A
SuperMicro P6SBU	MB6128	Intel 440BX	1024	4		AMI		Adaptec U2W	4	3	1	ATX	1 Yr.	$343	$543	$578	N/A	$633	$648	N/A	N/A	N/A	N/A	N/A
Tyan S1834 Tiger 133 (Dual)	MB6020	VIA Apollo Pro 133A	2048	4		Award		UltraDMA/66	6	1	1	ATX	3 Yrs.	$162	$362	$397	$397	$452	$467	$582	$772	$982	$562	$1002

Socket 370

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video	Integrated Controller	PCI Slots	ISA Slots	AGP Slot	AMR or CNR Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Celeron™ processor 566 MHz 128K OD 66MHz FSB	w/Intel Celeron 633 128K OD 66MHz FSB	w/Intel Celeron 667 128K OD 66MHz FSB	w/Intel Celeron 700 128K OD 66MHz FSB	w/Intel Celeron 733 128K OD 66MHz FSB	w/Intel Pentium III 733 256K OD 133MHz FSB	w/Intel Pentium III 800/EB 256K OD 100/133MHz FSB	w/Intel Pentium III 850 256K OD 100MHz FSB	w/Intel Pentium III 866 256K OD 133MHz FSB	w/Intel Pentium III 933 256K OD 133MHz FSB	w/Intel Pentium III 1000 256K OD 133MHz FSB
ABIT SE6	MB6512	Intel 815E	768	3	Award	Intel 815E	Intel 815E		6		1	1	ATX	1 Yr.	$172	$259	$287	$310	$341	$379	$407	$477	$592	$607	$782	$992
ABIT VH6	MB6511	VIA Apollo Pro 133A	768	3	Award	AC-97			5	1	1	1	ATX	1 Yr	$113	$200	$228	$251	$282	$320	$348	$418	$533	$548	$723	$933
ASUS CUBX	MB6726	Intel 440BX	1024	4	Award	AC-97			6	1	1		ATX	1 Yr.	$149	$236	$264	$287	$318	$356	N/A	$454	$569	N/A	N/A	N/A
ASUS CUSL2	MB6727	Intel 815E	1536	3	Award	Intel 815E	Intel 815E		5	1	1	1	ATX	1 Yr	$179	$266	$294	$317	$348	$386	$414	$484	$599	$614	$789	$999
ASUS CUV4X	MB6725	VIA Apollo Pro 133A	1536	3	Award	AC-97			5	1	1	1	ATX	1 Yr.	$130	$217	$245	$268	$299	$337	$365	$435	$550	$565	$740	$950
EPoX EP-3VCA	MB6854	VIA Apollo Pro 133A	768	3	Award	AC-97			4	1	1	1	ATX	2 Yrs	$105	$192	$220	$243	$274	$312	$340	$410	$525	$540	$715	$925
FIC FA11	MB6412	VIA Apollo Pro 133A	1024	4	Award				5	2	1		ATX	1 Yr.	$105	$192	$220	$243	$274	$312	$340	$410	$525	$540	$715	$925
Intel D815EEA "Easton"	MB6922	Intel 815E	512	3	Award	Intel 815E	Intel 815E		5		1	1	ATX	3 Yrs.	$175	$262	$290	$313	$344	$382	$410	$480	$595	$610	$785	$995
Shuttle AV14	MB6311	VIA Apollo Pro 133A	768	3	Award				5	2	1		ATX	1 Yr.	$96	$183	$211	$234	$265	$303	$331	$401	$516	$531	$706	$916
Shuttle ME64	MB6310	Intel 810E	512	2	Award	Intel 810E	Intel 810E		3			1	Micro ATX	1 Yr	$114	$201	$229	$252	$283	$321	$349	$419	$534	$549	$724	$934
SuperMicro 370SEA	MB6140	Intel 810E	512	2	AMI	Intel 810E	Intel 810E		6	1		1	ATX	1 Yr.	$142	$229	$257	$280	$311	$349	$377	$447	$562	$577	$752	$962
SuperMicro 370DLE (Dual)	MB6154	ServerWorks LE	2048	2	AMI				6	1			ATX	1 Yr	$342	$429	$457	$480	$511	$549	$577	$647	$762	$777	$952	$1162
SuperMicro 370DL3 (Dual)	MB6155	ServerWorks LE	2048	2	AMI				6	1			ATX	1 Yr.	$545	$632	$660	$683	$714	$752	$780	$850	$965	$980	$1155	$1365
Tyan S1854 Trinity 400	MB6018	VIA Apollo Pro 133A	768	3	Award				6	1	1		ATX	3 Yrs.	$109	$196	$224	$247	$278	$316	$344	$414	$529	$544	$719	$929

Slot 2

	Part Number	Chip Set	Maximum Memory (MB)	168-pin DIMM Sockets	Flash BIOS	Integrated Audio	Integrated Video	Integrated Controller	Integrated Networking	PCI Slots	ISA Slots	AGP Slot	Format	Manufacturer's Warranty	Motherboard Only	w/Intel® Pentium III® Xeon™ 550MHz 512K 100MHz FSB	w/Intel Xeon 550MHz 1M 100MHz FSB	w/Intel Xeon 550MHz 2M 100MHz FSB	w/Dual Intel Xeon 550MHz 512K 100MHz	w/Quad Intel Xeon 550MHz 512K 100MHz	w/Intel Xeon 700MHz 1M 100MHz FSB	w/Intel Xeon 700MHz 2M 100MHz FSB	w/Dual Intel Xeon 700MHz 1M 100MHz	w/Quad Intel Xeon 700MHz 1M 100MHz
SuperMicro S2DL3	MB6156	ServerWorks LE	4096	4	AMI			Adaptec Ultra160	Intel 82552	6	1		ATX	1 Yr.	$676	$1776	$3006	$5016	$2876	N/A	$2076	$3026	$3476	N/A
SuperMicro S2QR6	MB6190	ServerWorks HE	16384	16	AMI			Adaptec 2-Ch Ultra160	Intel 82559	8			SWTX	1 Yr.	$2732	$3832	$5062	$7072	$4932	$7132	$4132	$5082	$5532	$8332

You may get a "steal" on a motherboard like this for only $1 at www.aberbid.com

800-501-9464

www.aberdeeninc.com/max

Copyrighted material

2 ABERDEEN

The Straight Talk People℠
SINCE 1991

Hard Drive Logicube Duplication and Diagnostic Systems

Ideal for VAR & system integrators, MIS/IT departments, on-site service personnel, forensic investigative applications

- Clone over 1000 MB/minute
- Clone from 1 to 15 drives at once
- Master & target drives can be of different size, brand and model
- Master drive can hold up to 24 partitions
- Selective partitions: select one, some or all
- Bi-directional data transfer for forensic applications
- Comprehensive data recovery and drive wipe to DoD specs

1 Source → 1 Target

OMNICLONE SOLITAIRE

The Logicube OmniClone Solitaire is one of the most advanced one-to-one drive duplication solution on the market today.

- Single target, IDE hard drive to hard drive duplication
- Portable—Smallest unit on the market
- Data transfer speeds exceed 1000 MB/min
- Master & target drives can be of different size, brand and model
- Master can hold up to 24 partitions
- Selective partitions - Choose one or more partitions to copy
- Reverse data transfer - clone from target to master
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features - data recovery, drive wipe, and scanning
- Clone both ways thru a parallel port connection
- Includes carrying case, tools, cables, manual

$845
HDP500

1 Source → 2 Targets

OMNICLONE REPLIQUE 2

The OmniClone Replique 2 is the most portable way to copy to two native target drives.

- Dual target, IDE hard drive to hard drive duplication
- Compact—Smallest unit on the market
- Data transfer speeds exceed 800 MB/min
- Durable design—Metal case and heavy-duty removable hinge
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features—data recovery, drive wipe, and scanning
- Removable lid for easy use
- Easily upgraded to Replique 5 with the Replique 2 Expansion Station (Targets 3,4 & 5) *(HDP502)* for $1795.00

$1,995
HDP501

1 Source → 5 Targets

OMNICLONE REPLIQUE 5

The Replique 5 package is a complete one-to-five solution, just plug it in and clone!

- Five target, IDE hard drive to hard drive duplication
- Compact—Smallest unit on the market
- Data transfer speeds exceed 800 MB/min
- Durable design—Metal case and heavy-duty removable hinge
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features—data recovery, drive wipe, and scanning
- Modular—If one unit fails, you still have a 1 to 2

$3,650
HDP503

3 Sources → 15 Targets

OMNICLONE REPLIQUE 15

OmniClone Replique 15 clones up to 15 drives at once. The units can be detached and reassigned to fit workload needs. Comes with space saving docking station with sliding ball-bearing shelves.

- Fifteen target, three master, IDE hard drive to hard drive duplication
- Compact—Smallest unit on the market
- Data transfer speeds exceed 800 MB/min
- Durable design - Metal case and heavy-duty, ball bearing slides
- Any operating system—Scales FAT16, FAT32, and NTFS
- Comprehensive diagnostics features—data recovery, drive wipe, and scanning
- Modular—If one unit fails, you only lose two targets

$9,595
HDP505

OMNICLONE SOLITAIRE

Solitaire *HDP500*	$845.00
Solitaire OmniDiagnose *HDP506*	$99.00
Solitaire Extended Warranty (2 Years Total) *HDP531*	$195.00

OMNICLONE ACCESSORIES

OmniClone Adapter Kit 2.5" (1 Piece) *HDP522*	$39.95
OmniClone Adapter Kit 2.5" (3 Pieces) *HDP523*	$99.95
OmniClone Adapter Kit 2.5" (6 Pieces) *HDP524*	$179.95
OmniClone IDE/Power Cables 30" (1 Set) *HDP540*	$39.95
OmniClone IDE/Power Cables 30" (5 Sets) *HDP530*	$159.95

OMNICLONE REPLIQUE 2

Replique 2 *HDP501*	$1995.00
Replique 2 Expansion Station (Targets 3,4 & 5) *HDP502*	$1795.00
Replique 2 Selective Partition *HDP507*	$249.00
Replique 2 NTFS Clever Copy *HDP509*	$249.00
Replique 2 OmniDiagnose *HDP510*	$249.00
Replique 2 MasterManager *HDP541*	$249.00
Replique 2 Clone Pack (includes all options and carrying case) *HDP511*	$795.00
Replique 2 Extended Warranty (2 Years Total) *HDP532*	$495.00
Replique 2 Case *HDP535*	$99.95

OMNICLONE REPLIQUE 5

Replique 5 *HDP503*	$3650.00
Replique 5 Selective Partition *HDP512*	$395.00
Replique 5 OmniPrint *HDP513*	$395.00
Replique 5 NTFS Clever Copy *HDP514*	$395.00
Replique 5 OmniDiagnose *HDP515*	$395.00
Replique 5 Clone Pack (includes all options and carrying case) *HDP516*	$1249.00
Replique 5 Extended Warranty (2 Years Total) *HDP533*	$695.00
Replique 5 Case (Requires purchase of 2 cases) *HDP536*	$198.90

OMNICLONE REPLIQUE 10

Replique 10 Selective Partition *HDP517*	$545.00
Replique 10 NTFS Clever Copy *HDP519*	$545.00
Replique 10 OmniDiagnose *HDP520*	$545.00
Replique 10 MasterManager *HDP543*	$545.00
Replique 10 Clone Pack (includes all options) *HDP521*	$1635.00

OMNICLONE REPLIQUE 15

Replique 15 (3 Master / 15 Target) metal case and heavy-duty, ball bearing slides *HDP505*	$9595.00
Replique 15 Selective Partition *HDP545*	$695.00
Replique 15 NTFS Clever Copy *HDP546*	$695.00
Replique 15 OmniDiagnose *HDP547*	$695.00
Replique 15 MasterManager *HDP544*	$695.00
Replique 15 Clone Pack (includes all options) *HDP548*	$2085.00
Replique 15 IDE and Power Cables (18 x 5" Sets) *HDP558*	$399.95
Replique 10 Docking Station *HDP537*	$849.95

800-501-9464
www.aberdeeninc.com/max

Logicube

Copyrighted material

The Straight Talk People℠
SINCE 1991

ABERDEEN 3

VIDEO ADAPTERS

3Dlabs Oxygen VX1 **GLINT R3** 32MB.....$210.99
3Dlabs Oxygen GVX1**R3 w/GAMMA** 32MB$699.99
3Dlabs Oxygen GVX210 **Dual R3** 64MB..$1559.99
Asus V6600 **GeForce 256 Pure**.....$227.99
Asus V6600 **GeForce 256 Pure Deluxe**....$250.99
Asus V6800 **GeForce 256 DDR Pure**.....$237.99
Asus V6800 **GeForce 256 Pure Deluxe**....$333.99
Asus V7700 **GeForce2 GTS Pure** $309.99
ELSA Gladiac **GeForce2 GTS** 32MB.....$339.99
Hercules 3D Prophet DDR-DVI **GeForce**....$249.99
Guillemot 3D Prophet SDR **GeForce**.....$189.99
Guillemot Maxi Gamer Cougar **TNT2 M64** ...$89.99
Jaton 97AGP2X **Trident985** 4MB SGRAM ...$29.99
Jaton 67Pro **Trident975** 4MB EDO PCI.....$31.99
Leadtek WinFast **GeForce 256** 32MB.....$235.99
Leadtek WinFast **GeForce 256 DDR** 32MB$263.99
Leadtek WinFast **GeForce2 GTS DDR** 32M$319.99
Leadtek WinFast **GeForce2 GTS DDR** 64M$369.99
Pine PT5968-28 **SiS6326** AGP2X 8MB.....$30.99
Pine PT5968-67 **SiS6326** PCI 4MB $26.99
Pine PT5968-68 **SiS6326** PCI 8MB $30.99
Pine PT5988-16 **TNT2 Vanta LT** 16MB $68.99
Pine PT5988-32 **TNT2 M64** 32MB.....$78.99

3dfx

3Dfx **Voodoo2** 1000 12MB PCI 3D add-on..$85.99
3Dfx **Voodoo3** 2000 16MB AGP.....$86.99
3Dfx **Voodoo3** 3000 16MB AGP/PCI.....$111/140
3Dfx **Voodoo3** 3500 16MB AGP $176.99
3Dfx **Voodoo5** 5500 64MB AGP $326.99

ATi

3D Charger 4MB PCI/AGP.....$32/37
All-in-Wonder Pro 128 16MB/32MB.....$147/211
RADEON 64MB DDR AGP4X.....$399.99
RADEON 32MB DDR AGP4X.....$279.99
RAGE Fury Pro **RAGE 128 PRO** 32MB $114.99
RAGE Fury MAXX **2xRAGE128 PRO** 64MB$173.99
TV Wonder TV Tuner for Overlay Support....$88.99
Xpert2000 **RAGE 128** 32MB AGP $80.99
Xpert98 RAGE PRO 8MB $39.99
Xpert@Play98 RAGE PRO PCI/AGP 8MB....$52.99

DIAMOND MULTIMEDIA

SpeedStar A200 S3 **Savage 4 Pro** 8MB.....$35.99
Stealth **III** S540 S3 **Savage 4 Pro** 32MB.....$72.99
Viper **II Savage 2000** 32MB.....$159.99
Viper **II Savage 2000** 32MB OEM $148.99

matrox

Millennium G400 MAX **AGP4X** 32M $222.99
Millennium G400 **AGP4X** 32M OEM.....$160.99
Millennium G400 SH **AGP4X** 32M OEM $120.99

ETHERNET CARDS

10Base-T Ethernet
3Com 3C509B-Combo EtherLink Retail.....$125.99
3Com 3C900B-Combo EtherLink XL Bulk....$66.99
SmartLink 16-Bit ISA Jumperless Combo ...$14.99
SmartLink 32-Bit PCI Jumperless Combo ...$14.99
10/100 Fast Ethernet
3Com 3C905C-MTX Fast ELinkXLPCI Bulk..$63.99
3Com 3C905C-MTX Fast ELinkXLPCI Retail $85.99
3Com 3C905C-MTX Fast ELinkXLPCI 20-pk.$1199
Intel EtherExpress PRO/100+ PCI w/Boot...$48.99
Intel PILA8470-B Server AdapterPCI $103.99
SmartLink 10/100Base-TX PCI.....$19.99

CONTROLLERS

Adaptec ARO-1130U2 Kit Ultra2 LVD PCI..$299.99
Adaptec 19160 Ultra160/LVD 32-bit PCI ...$259.99
Adaptec 29160 Ultra160/LVD 64-bit PCI ...$349.99
Adaptec 39160 Ultra160/LVD PCI 2-Ch.....$399.99
KSI KW-801V75 Symbios UltraWide SCSI...$79.99
Mylex eXtremeRAID 3-Chl RAID $1729.99
Promise FastTrak100 IDE RAID (0,1,0+1) $116.99
Promise FastTrak66 IDE RAID (0,1,0+1) $94.99
Promise Ultra66 PCI UltraATA/66 .....$29.99
Promise Ultra100 PCI UltraATA/100 .....$49.99
SIIG Duet Slot Saver 2xECP/EPP ISA.....$54.99
SIIG Duet Slot Saver 2xECP/EPP PCI.....$79.99

MONITORS

17" KDS AV-7TF .24AG **Trinitron** *CRI304* ...$277.99
17" KDS VS-7i 1280 NI .27 *CRI232*.....$199.99
17" KDS VSx-7e w/**Spkrs** *CRI349*.....$244.99
19" KDS VS19sn .25 **Short Neck** *CRI353*...$386.99
17" Mitsubishi DP710 .25 **DiamondTron**...$416.99
19" Mitsubishi DP900u .25 **DiamondTron** .$675.99
21" Mitsubishi DP200 .24 **DiamondTron**...$979.99
19" Sony CPD-G400 **Trinitron** .24AG $658.99
21" Sony CPD-G500 **Trinitron** .24AG $1242.99
24" Sony GDM-W900 **Wide Trinitron** $2366.99

HYUNDAI

Hyundai DeluxScan monitors with 90-days DOA replacement guarantee.
15" S560 1024@60Hz .28 *CRI908*.....$135.99
17" S770 1280@60Hz .27 *CRI909*.....$205.99
17" F790 1600@76Hz .24sp **Flat** *CRI913*..$279.99
19" P910 1792@75Hz .26 *CRI907*.....$300.99
21" P210 1792@75Hz .25 *CRI916* $612.99
LCD (Flat Panel)
15" LM1500A LCD 1024@85Hz *LCD901*...$909.99
15" LM1510A LCD w/**USB&Spkrs** *LCD902*.$959.99

TATUNG

14" C4MTR 1024 NI .28 *CRI738* $125.99
15" C5BZR 1280 NI .28 OSD *CRI737* $142.99
17" C7BZR-25 1280NI .25 OSD *CRI734* $213.99
19" C9RZR 1280NI .26 OSD *CRI735* $379.99

ViewSonic®

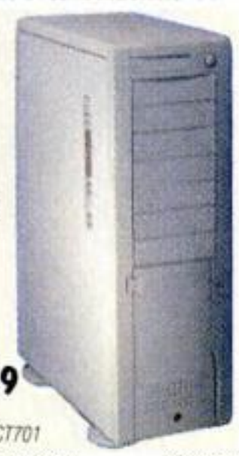
17" Opti Q75 1600@69Hz .25 *CRI832*.....$277.99
17" GS773 1280@76Hz .26 **Short Depth**.$295.99
17" PS775 1600@77Hz .25 **Short Depth**.$354.99
17" PF775 1600@77Hz .25 **PerfectFlat**...$344.99
17" PF77 .25 **PerfectFlat Analog/Digital** ..$419.99
19" Opti Q95 1600@76Hz .26 *CRI829*.....$354.99
19" GS790 1600@76Hz .26 **Short Depth**.$426.99
19" PS790 1600@76Hz .25 **Short Depth**.$559.99
19" PF790 1600@88Hz .25 **PerfectFlat**...$483.99
19" PF795 1920@73Hz .25 **PerfectFlat**...$565.99
21" G810 1600@71Hz .25 *CRI809*.....$838.99
21" P810 1600@76Hz .25 *CRI845* $867.99
21" PF815 1920@75Hz .25 **PerfectFlat**...$929.99
21" P815 1800@76Hz .25 **USB** *CRI862* $943.99
21" Opti Q115 1600@76Hz .26.....$739.99

CASES

Visit www.aberdeeninc.com/max for details on our full line of cases.

Desktop (T) 3x5¼" 4x3½" (2 hid) 230W.....$59.99
Mini Tower 3x5¼" 2x3½"(2 hidden) 230W $29.99
Mid Tower 3x5¼" 4x3½"(2 hidden) 230W .$59.99
Full Tower 4x5¼" 3x3½"(1 hidden) 300W $149.99
SuperMicro SC701A 235W $89.99
SuperMicro SC730A 235W $89.99
SuperMicro SC750A/S 300W (Fits Xeon) ..$158.99
SuperMicro SC760A 300W (Rdd Cool PS)$168.99
SuperMicro SC801SA/AX 2x300W.....$598/618

The Ultimate PC Enclosure
MAXIMUM PC Magazine Dream Machine '98



- **8 x 5¼" bays (1 internal)**
- **3 x 3½" bays (2 internal)**
- **300W ATX V2.01** UL **Power Supply**
- **8 cm thermal back-up fan, room for 4 more optional fans**
- **Swing out doors**
- **Adjustable feet**
- **Air filter**

$149.99 CT701

Addtronics 7890A 8x5¼" 3x3½" 300W $149.99
Addtronics 6890A 5x5¼" 3x3½" 250/300W $109/129
Addtronics 3890A 3x5¼" 4x3½" 250/300W $79/99

UPS

APC Back-UPS 500 *UPS500* $137.99
APC Back-UPS Pro 350 (USB) *UPS507*.....$181.99
APC Back-UPS Pro 650 *UPS501* $290.99
Archtek SmartLink SLS-330 *UPS100*.....$69.99
Archtek SmartLink SLS-460 *UPS101*.....$82.99

CD-ROM / MULTIMEDIA

DVD Drives / MPEG Decoding
Creative PC-DVD Encore 12X **Dxr3**.....$249.99
Shuttle SDVD-101 10X/40X ATAPI DVD $129.99
Hitachi GD-5000 8X/40X ATAPI DVD.....$154.99
Toshiba SD-M1402 12X/40X ATAPI DVD ...$125.99
Toshiba SD-M1401 12X/40X SCSI DVD $175.99
Tosh. SD-R1002 4X4X4X24X CDRW/DVD .$284.99
Toshiba SD-W1111 SCSI 5.2GB DVD-RAM$434.99
REALmagic Hollywood+ DVD Decoder $69.99
CD-ROM
Acer 50X ATAPI CD-ROM.....$45.99
Kenwood TrueX 72X ATAPI CD-ROM.....$132.99
Plextor UltraPleX Wide SCSI 40X Reader ...$135.99
Toshiba XM-6401B 40X SCSI CD-ROM.....$82.99
Toshiba XM-6702B 48X ATAPI CD-ROM.....$59.99
CD-Recorder / CD-ReWriters
HP CD-Writer 9300i ATAPI 10X/4X/32X $260.99
HP CD-Writer 9200i SCSI 8X/4X/32X $309.99
Plextor PlexWriter 8X/4X/32X ATAPI $249.99
Plextor PlexWriter 12X/10X/32X ATAPI.....$319.99
Plextor PlexWriter 12X/4X/32X SCSI $386.99
Sound Cards
Creative VIBRA 128 OEM $23.99
Diamond Monster Sound MX400 OEM PCI..$55.99
Pine Crystal ISA/PCI Audio PnP $17.99/19.99
Sound Blaster Live! OEM $55.99
Sound Blaster Live! MP3+ Retail.....$99.99
Sound Blaster Live! X-Gamer Retail.....$97.99
Sound Blaster Live! Platinum PCI Retail.....$197.99
Speakers
Altec Lansing ADA305 **Digital USB** 3-pc ..$151.99
Cambridge PCWorks FourPointSurround $79.99
Cambridge FPS2000 **Digital** 5-pc $151.99
Cambridge DeskTop Theater 5.1 DTT2500$289.99
MidiLand MLi-270TA 2-pc 36W w/3DSP.....$29.99
MidiLand MLi-480 3-pc 30W.....$39.99
S4 MidiLand 7100 7-pc 100W 5.1 Digital .$175.99
S4 MidiLand 8200 8-pc 200W 5.1 Digital .$345.99

MEMORY

Memory prices change frequently. Please call or visit our web site at www.aberdeeninc.com/max for latest prices.

4Mx32 (16MB) 72-pin 60ns EDO.....$55.99
4Mx36 (16MB) 72-pin 60ns Parity.....$55.99
8Mx32 (32MB) 72-pin 60ns $98.99
8Mx32 (32MB) 72-pin 60ns EDO.....$98.99
8Mx36 (32MB) 72-pin 60ns Parity.....$104.99
8Mx64 (64MB) **PC100** SDRAM.....$81.99
16Mx64 (128MB) **PC100** SDRAM.....$161.99

All Corsair and Kingmax memory modules are built with the highest quality components and guaranteed for compatibility, or your money-back within 30-days of purchase without any restocking fees. Lifetime warranty.

Corsair PC100 CAS-2 SDRAM
CM654S64-BX2 64MB CAS-2 *MYC210*.....$106.99
CM654S128-BX2 128MB CAS-2 *MYC211* ..$208.99
CM654S256-BX2 256MB CAS-2 *MYC224* ..$419.99
Corsair PC100 ECC SDRAM w/Parity
CM734S64-BX2 64MB CAS-2 *MYC218*.....$129.99
CM734S128-BX2 128MB CAS-2 *MYC219*..$235.99
CM724S256-BX2 256MB CAS-2 Unreg. ...$498.99
CM764S256-BX2 256MB CAS-2 Reg. $489.99
CM754S512-GX 512MB *MYC229*.....$1025.99
Corsair PC133 SDRAM
CM654S64-133 64MB *MYC220* $109.99
CM654S128-133 128MB *MYC221* $213.99
CM654S128-133C2 128M CAS2 *MYC252* .$239.99
CM734S128-133 128MB ECC *MYC227*.....$239.99
CM654S256-133 256MB *MYC223* $434.99
CM734S256-133 256MB ECC *MYC228*.....$494.99
Kingmax TinyBGA SDRAM
8Mx8 (64MB) PC133 SDRAM $87.99
8Mx8 (128MB) PC133 SDRAM $173.99
16Mx4 (256MB) PC133 SDRAM $379.99
16Mx4 (256MB) PC133 ECC SDRAM $413.99
Kingmax SODIMMs
4Mx16 (32MB) PC100 SDRAM $49.99
8Mx8 (64MB) TinyBGA PC100 SDRAM $89.99
16Mx4 (64MB) PC100 SDRAM $177.99

CAT 5 PATCH CABLES

Category 5 Patch Cable, 4-Twisted Pairs, Molded, in grey, red, green, blue or yellow

3 foot $4.75
7 foot $5.99
10 foot $6.99
14 foot $9.99
25 foot $14.99
50 foot $19.99

HARD DRIVES

Enhanced IDE
10.2GB Maxtor 51024U2 7200rpm.....$102.99
10.2GB WD102AA 9.5ms 2048K Ultra66....$81.99
10.2GB WD102BA 2048K 7200rpm.....$111.99
15.0GB Quantum Fireball LM 7200rpm $122.99
15.3GB Maxtor 51536U3 9ms 7200rpm ...$115.99
20.4GB Quantum Fireball LCT10 Ultra66...$119.99
20.5GB Quantum Fireball LM 7200rpm $159.99
20.0GB IBM Deskstar 75GXP **Ultra100**.....$172.99
20.5GB Seagate BarracudaATAII7200rpm .$150.99
20.4GB WD204BA 2048K 7200rpm.....$143.99
30.0GB IBM Deskstar 75GXP **Ultra100**.....$204.99
30.0GB Maxtor 53073H6 9ms **Ultra100** ...$185.99
30.0GB Quantum Fireball LM 7200rpm $175.99
30.6GB Quantum Fireball LCT10 Ultra66...$151.99
30.6GB Seagate BarracudaATAII7200rpm .$197.99
30.7GB WD307AA 9.5ms 2048K Ultra66..$137.99
40.0GB Maxtor 54098H8 9ms **Ultra100** ...$255.99
40.0GB Quantum Fireball AS **Ultra100** .....$Call
45.0GB IBM Deskstar 75GXP **Ultra100**.....$279.99
45.0GB WD450AA 9.5ms 2048K Ultra66..$223.99
60.0GB IBM Deskstar 75GXP **Ultra100**.....$479.99
60.0GB Maxtor 96147H8 9m **Ultra100**.....$223.99
60.0GB Quantum Fireball AS **Ultra100** .....$Call
75.0GB IBM Deskstar 75GXP **Ultra100**.....$629.99
Ultra160 SCSI (LVD)
9.1GB IBM Ultrastar 9LZX **10000**rpm.....$302.99
9.1GB Quantum Atlas V 6.3ms $240.99
9.1GB Seagate Barracuda XL 5.8ms $250.99
9.2GB Seagate Cheetah XL **10033**rpm.....$300.99
18.3GB IBM Ultrastar 18LZX **10000**rpm....$519.99
18.2GB Quantum Atlas V 6.3ms $375.99
18.2GB Seagate Barracuda XL 5.8ms $373.99
18.4GB Seagate Cheetah XL **10033**rpm....$452.99
18.4GB Seagate Cheetah X15 **15000**rpm..$637.99
36.4GB Quantum Atlas V 6.3ms $696.99
36.9GB IBM Ultrastar 36LZX **10000**rpm....$663.99
36.4GB Quantum Atlas10KII **10000**rpm $726.99
36.4GB Seagate Cheetah36LP**10000**rpm ..$705.99
73.4GB Seagate Cheetah 73 **10000**rpm ..$1326.99
PC Power & Cooling Bay-Cool (ext 5¼ bay) .$59.99

REMOVABLE DRIVES

Castlewood ORB 2.2GB Int. EIDE $219.99
Iomega Jaz 2GB Internal SCSI $344.99
Iomega Zip 250MB External SCSI-2 .....$173.99
Iomega Zip 100MB ATAPI/SCSI Insider bulk $64/99
Iomega Zip 100MB External **USB** $121.99
Iomega Zip cartridge Single/10-Pack.....$13/105
LS-120 "SuperDisk" Int. Drive.....$85.99

FAX MODEMS

3Com Sportser External USB V.90 56K $145.99
3Com 56K V.90 Internal.....$96.99
Diamond SupraSonic II 112K dual-line $152.99
Pine PT36215 56K V.90 w/Voice & Spkr.....$21.99
SmartLink 5634BTS 56K V.90 x2 w/Voice...$46.99
SmartLink 5634PCI 56K V.90 PCI w/Voice..$32.99
SmartLink 5634TS 56K V.90 External w/V ..$63.99
SmartLink 56UST 56K V.90 External USB ..$57.99

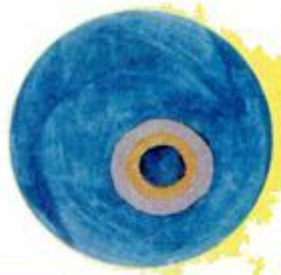
ETHERNET HUBS

3Com

OfficeConnect Hub TP4 3C16704 .....$59.99
OfficeConnect Hub TP4Combo 3C16703 ....$79.99
OfficeConnect Hub 8 /TPC 3C16701.....$89.99
OfficeConnect Hub TP400 3C16723 .....$109.99
OfficeConnect Fast EtherHub 8 3C16722A $169.99
OfficeConnect Hub TP1200 3C16721 .....$319.99
OfficeConnect Switch 400 3C16733 .....$319.99
OfficeConnect Networking Kit.....$199.99

Archtek

SmartLink 9-Port 10BT Hub 9+1 RJ-45.....$28.99
SmartLink 17-Port 10BT Hub 16+1 RJ-45..$49.99
SmartLink 10/100 5-Port Switch $58.99
SmartLink 10/100 8-Port Switch $76.99
SmartLink 10/100 16-Port Switch $182.99
SmartLink 10/100 24-Port Switch f/ Rack $341.99
SmartLink Internet Sharer $143.99
SmartLink Printer Switch $94.99



ABERDEEN
9130 Norwalk Boulevard
Santa Fe Springs, CA 90670
562-699-6998 Fax 562-695-5570

800-501-9464

www.aberdeeninc.com/max

Mon-Fri 6:00 AM - 7:00 PM PST
Tech Support 8 AM - 5 PM Mon-Fri
email: sales@aberdeeninc.com

VISA MasterCard DISCOVER

Ad Code # MAXPC010

"Build your own system or buy off-the-shelf PCs or peripherals-- either way it's a bargain. Excellent Web site too." PC Computing February 1998
THE Direct 100

BUY WITH 9 COMPUTER SHOPPER YEARS CONFIDENCE

WHY ABERDEEN?

- Straight Talk℠
- Our 9th Year of Happy Customers
- Quick Response and Delivery
- Custom Configurations
- No Credit Card Surcharges
- We Check against Credit Card Fraud for Your Protection
- 30-Day Money Back Guarantee on Systems*
- One Year Parts and Labor Warranty
- Toll Free Technical Support
- 220V Units Always in Stock
- International Orders Welcome. Se habla Español.

DEALERS, VARs, CONSULTANTS!
Call for details on our aggressive reseller program. Get the quality and service you deserve. Call for our Confidential Reseller Price List.

TERMS and CONDITIONS: Purchase Orders accepted on approved credit. Corporate, government and university PO's welcomed. Fax lines are open 24-hours. Prices are in US Dollars, FOB Santa Fe Springs. Prices and specifications subject to change. No refunds on shipping and handling charges, opened software. *Aberdeen reserves the right to charge a 15% restocking fee on returns. Monitors are non-refundable except with Systems. Overnight DOA replacements at Aberdeen's discretion on Systems only. Absolutely no returns without an RMA return authorization. Sorry—please no initial orders less than $100. **"Straight Talk" and "The Straight Talk People" are service marks of Aberdeen LLC.** Intel, the Intel Inside Logo, Pentium are registered trademarks and Pentium III Xeon, Celeron, MMX are trademarks of Intel Corporation. Athlon is a trademark of Advanced Micro Devices, Inc. Other trademarks are of their respective owners. © 1991-2000 Aberdeen LLC. maxpc010

800-501-9464
www.aberdeeninc.com/max

Appropriate Material

Roland ED

So portable, it's powered by your creative genius.

Microsoft® Windows® '98 & 2000

Also compatible with Macintosh OS 9.04

USB UNIVERSAL SERIAL BUS

Actual size is just 7"(w) x 1.5"(h) x 6.25"(d)

Imagine creating your next audio masterpiece on the plane, in the car, or anywhere you can use your laptop. This self-powered USB audio interface provides all the audio connections you need to record, playback, and monitor high-quality audio from your desktop or laptop computer. It's powered by the USB port, so the only extra juice it needs is your creative genius. A wide assortment of audio inputs let you connect anything from mics and guitars to mini-discs, CD players and DAT machines. There are even optical and digital inputs. If you've been looking for a clean and versatile audio interface solution for your PC, look no further. The UA-30 has all the connections you need for a price you'll find hard to believe: just $325.

Roland ED
UA-30
USB Audio Interface

Distributed by Edirol

EDIROL
A member of the Roland Group

Call for our huge FREE color catalog

1-800-380-2580

www.edirol.com

Dealer inquiries welcome.

Putting the future of desktop media production into your hands!

Copyrighted material

Hot Deals on Drives & Accessories!

1-800-473-0962

WE'RE NOT JUST DRIVES ANYMORE...CHECK US OUT ON THE WEB!

www.dirtcheapdrives.com

Leading the hard drive industry for more than a decade with unlimited lifetime technical support!

Winner of TWO 1999 Computer Shopper's Choice Awards

800# Hours: Monday - Friday: 8am - 8pm • Saturday: 9am - 3pm, CST • Fax: (281) 534-6452

SONY

Tape Drive

Ultra Wide SCSI/DDS-4

$969 20-40GB

Int. (SDT11000AI) **$1139 Ext.** (SDT11000XM)

TOSHIBA

DVD RAM Drive

1x16x2 $409 Bare ***SCSI-2***

Reads DVD-ROM, DVD-R, CD-ROM, DVD & CD Video, CD Audio, CD-R & CD-RW disks. (SDW1111)

HEWLETT PACKARD LASER PRINTER

USB interface, Networking, 133MHz processor, 16MB Ram, expandable memory up to 200 MB, security, management & convenience

(C7829B) **$1239**

More than 20 models to choose from starting at just $349!

Seagate

Hard Drive w/16MB of Cache!

36.7GB *Ultra 160 SCSI*

$669 160MB/sec data transfer rate & 10,000rpm

Int. (ST336704LWV) *This drive is LARGE, FAST and BAD!*

Quantum

IDE Hard Drives w/2MB Buffers

Ultra ATA-66

10GB - 30GB ***7200rpm***

10.2GB Int. (QMP10200LM) **$95**
15.0GB Int. (QMP15000LM) **$109**
20.0GB Int. (QMP20500LM) **$142**
30.0GB Int. (QMP30000LM) **$183**

COLOR INKJET PRINTER EPSON

Epson Stylus Color 900N, 1440x720 dots per inch clarity fro a laser sharp image. Prints 10 to 12 ppm, Network ready, Ethernet connectivity. Works with PCs or Macs. (C265111) **$555**

Ask about our great rates on ink cartridges, film & paper!

YOU ASKED FOR IT ... WE'VE GOT IT!

Motherboards, processors, graphics cards, monitors, scanners, printers, multimedia stuff, networking hubs & switches, servers, complete computer stations, solid state drives, memory, solid state drives, digital cameras & more!

YAMAHA

CD-RW Drive

8x4x24 $229 ***SCSI-2***

W/Mastering Software & 1 disk • 4MB buffer, tray load

Int. (YCRW8424WOW) **$269 Ext.** (YCRW8424MX)

Call for our latest pricing on DVD drives and accessories!

WaveLink PC to TV Transmitter

View DVD movie titles on TV without the use of wires. Get crisp color & stereo audio up to 300 feet away.

(PCTOTV) $119 or $109 w/drive purchase

Dirt Cheap Drive's DVD Kit

16X IDE Kit complete w/MPEG-2 Decoder. 16XDVD reader, 40X CD ROM, Supports CDR and CD-RW media.

Complete Kit (DVD16KIT) $175

12x DVD Drive Kit by Creative™

(CLDVD12KIT) $229

DVD Utility Software (PC or Mac)

(DCDSFTPC-NT)/(DVDSFTMAC) $59

DVD RAM Media

Record up to 5.2GB (DVDRAMDISK)

1-4/5-9/10+

$37/$35/$33

HARD DRIVES

Quantum

Ask about our Quantum IDE Ultra ATA/66 Deals

Capacity	Cache	RPM	Product No.	Price
ULTRA 160 SCSI - (160 MB per second data transfer rate)				
9.1GB	4MB	7,200	XC309100LW	$189
9.2GB	8MB	10,000	TY309200LW	$339
18.3GB	4MB	7,200	XC318400LW	$329
18.4GB	8MB	10,000	TY318400LW	$515
36.7GB	4MB	7,200	XC336700LW	$649
36.4GB	8MB	10,000	TY336700LW	$899
73.4GB	8MB	10,000	TY373400LW	$1599

IBM

We carry many types of backup software. Call.

Capacity	Cache	RPM	Product No.	Price
ULTRA ATA-100 IDE				
20.5GB	512k	5400	07N3924	$99
30.7GB	2MB	7200	07N3929	$179
46.1GB	2MB	7200	07N3931	$269
76.8GB	2MB	7200	07N3935	$555
ULTRA 160 SCSI - (160 MB per second data transfer rate)				
9.1GB	4MB	7200	07N3120	$229
9.1GB	4MB	10,000	07N3220	$249
18.2GB	4MB	7200	07N3110	$333
18.3GB	4MB	10,000	07N3210	$385
36.4GB	4MB	7200	07N3100	$575
36.4GB	4MB	10,000	07N3200	$619

Seagate

Need a cable? We've got the cable you're looking for.

Capacity	Cache	RPM	Product No.	Price
ULTRA ATA-66 IDE				
10.2GB	512k	5400	ST310212A	$79
15.3GB	512k	5400	ST315323A	$89
15.3GB	2MB	7200	ST315320A	$109
20.4GB	2MB	7200	ST320420A	$135
20.4GB	512k	5400	ST320423A	$89
30.6GB	2MB	7200	ST330630A	$179
ULTRA 160 SCSI - ***DATA TRANSFER UP TO 160MB PER SECOND!***				
9.2GB	2MB	7200	ST39236LW	$219
9.2GB	4MB	7200	ST39236LWV	$229
9.2GB	4MB	10,000	ST39204LW	$249
18.4GB	2MB	7200	ST318436LW	$299
18.4GB	4MB	7200	ST318436LWV	$319
18.4GB	4MB	15,000	ST318451LW	$565
36.7GB	4MB	10,000	ST336704LW	$619
36.7GB	16MB	10,000	ST336704LWV	$669
73.4GB	4MB	10,000	ST173404LW	$1129
73.4GB	16MB	10,000	ST173404LWV	$1199

Ultra SCSI and Ultra Wide SCSI are also available. Call for pricing.

USB STUFF

4x4x6 CD Rewritable for PC or Mac	CRX100E/X2	$299
100MB/250MB Zip Drive	ZIP100USB/ZIP250USB	$102/$169
USB to SCSI Adapter	USBSCSI	$69
SuperDisk Drive, 120MB & Floppy (For Imacs & G3s)	USBLS120	$139
Floppy Drive	USBFLOPPY	$85
10GB Hard Drive	USB10GB	$159
15GB Hard Drive	USB15GB	$169
20.4GB Hard Drive	USB20GB	$185
30GB Hard Drive	USB28GB	$229
Firewire (1394) USB/PCI Controller – *Call!*	70HTL00060	$139

CD MEDIA

DIRT CHEAPEST PRICES ON CD MEDIA!

CD Recordable & Rewritable Media

CDR-74 Recordable	Speed	Item Number	Price
Budget 5 pack	12x	CDR74B-5	$5
Budget 20 pack	12x	CDR74B-20	$18
Budget 50 pack	12x	CDR74B-50	$42
Budget 100 pack	12x	CDR74B-100	$78
CDR-74W Rewritable			
Budget 5 pack	4x	CDR74WB-5	$6
Budget 20 pack	4x	CDR74WB-20	$24
Budget 50 pack	4x	CDR74WB-50	$56
Budget 100 pack	4x	CDR74WB-100	$104
CDR-74 Printable			
Budget 5 pack	12x	CDR74PB-5	$4
Budget 20 pack	12x	CDR74PB-20	$15
Budget 50 pack	12x	CDR74PB-50	$35
Budget 100 pack	12x	CDR74PB-100	$66
CDR-80 Hot 80 minute media for more storage space!			
Budget 5 pack	12x	CDR80-5	$4
Budget 20 pack	12x	CDR80-20	$13
Budget 50 pack	12x	CDR80-50	$32
Budget 100 pack	12x	CDR80-100	$59

For complete terms and policies, please see our website's checkout stand.

PIONEER

- 16X DVD reader, 95ms
- 40X CD ROM, 80ms
- Bare IDE Drive tray load *(Also avail as slot load)* (DVD115) $115
- 16X DVD reader, 95ms • 40X CD ROM, 80ms Bare IDE Drive slot load (DVD105) $125
- 10X DVD reader, 120ms • 40X CD ROM, 90ms Bare SCSI Drive slot load (DVD304) $145
- DVD Recorder, DVD-R write 1x, DVD-R read 2x, 4MB buffer, Inc. write, DVD software + 3 DVD disks (DVRS201) **$3879**

CD REWRITABLES

Sony 10x4x32 SCSI Packet write, 4MB buffer, writes to CDR (write once) at 10x, CDRW (rewritable) at 4x, and reads at 32x

Internal drive (CRX145S)/External drive (CRX145SX) $319/$379

Hewlett Packard 10x4x32 IDE Packet write, 4MB buffer, tray load, writes to CDR (writes once) 8x, CDRW (rewritable) 4x, reads 32x

Internal includes software (C4492A) $275

Plextor 12x4x32 SCSI Packet write, 4MB buffer, tray load

Internal drive (PXW12432B) $299

External drive (PXW12432BX) $359

Yamaha 8x8x24 IDE Packet write, 4MB buffer, tray load

Internal drive (YCRW8824E) $169

This is just a sampling. Call for more deals!

Para Llamadas en Español:

1-800-473-0960

Copyrighted Material

PROFESSIONAL DISK DUPLICATION

CLONE, TEST OR REPAIR ANY HARD DRIVE

$995!

- SUPPORTS IDE, SCSI, SCA & NOTEBOOK DRIVES
- COPIES AND SERVICES HARD DRIVES
- PRINTS TEST REPORTS ON YOUR PRINTER
- DATA RECOVERY MODE BUILT-IN

Copy entire hard drives with this pro service station. Set up any SCSI or IDE drive with your original software. Attach a blank drive and press start. Make copies quickly and easily.

Use the built-in drive service system to make used drives run like new! Eliminate defective sectors, and restore hard drives to error-free condition with the factory re-mapping system. Test hard drives for top reliability using the built-in test feature. Print analysis reports on any standard parallel printer. Get the technology used by drive repair services. Call today!

25GB MP3 PLAYER

$395!
after mail-in rebate

- PLAYS OVER 10,000 SONGS FROM HARD DISK!
- PLAYS STANDARD AUDIO AND MP3 CDs AND CD-R
- DOWNLOADS MP3 FROM CD-R TO HARD DRIVE
- POWER AMPLIFIER DRIVES SPEAKERS DIRECTLY

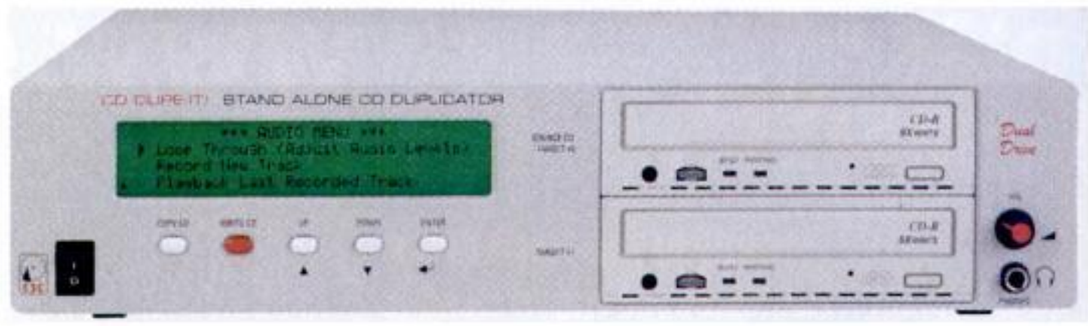
MP3 is here! Get high performance digital sound and store over 15,000 songs on hard disk. Download over 300 songs from a single CD!

Grab new music from the net. Use your PC to create custom MP3 CDs with just the songs you like. Load them to the internal hard drive for realistic, 3-D theater sound. Patented digital signal processing gives you crystal clear sound. No PC connection is required. Connect any stereo system, or directly power external speakers. Get digital sound and room-filling bass.

The hard drive organizes your music in folders. ID-3 tags display the title, album, and artist on a large LCD. Use the jukebox feature for an entire evening of great music. Play songs randomly or in sequence from the internal hard drive. Unlike CD changers, the A/V certified 25 GB hard drive won't wear out, even under continuous use. Call now and try your MP3 player tomorrow!

COPY ANY CD NOW NO PC REQUIRED

from $995!



- MULTI-FORMAT DUPLICATION - FAST AND EASY!
- DUAL 8X DRIVES MAKE TWO COPIES AT ONCE
- INTERNAL 25GB HARD DRIVE STORES IMAGES
- PRO AUDIO MODEL HAS SP/DIFF AND ANALOG I/O

Instantly copy music and CD-ROM compact discs. Make backup copies of your favorite music and software on rugged, permanent CDs. Produce discs quickly and economically. Make custom audio CDs with just the songs you like.

Use our dual drive units to copy two CDs simultaneously, or choose the Pro Audio modelto make crystal clear music CDs from any analog or digital source. Dupe-It copiers are totally self-contained. No additional software or hardware is required. Call today for more information!

MULTI DRIVE IDE DUPLICATORS

from $495!

- COPIES EVERYTHING, PARTITIONS, O/S, THE WORKS!
- BOTH STANDARD AND ULTRA, FOUR AND SEVEN DRIVE MODELS ARE AVAILABLE NOW!
- THE ULTIMATE HIGH SPEED PRODUCTION TOOL FOR SYSTEM BUILDERS AND CORPORATE MIS

Copy entire hard drives with ease. Multi-drive duplicators are an essential tool for dealers and system builders. Why spend hours installing and formatting drives when you can dupe them instantly? Work like the pros. Get your own multi-drive, stand-alone duplicators today. CSC offers a complete line of four and seven drive copiers in both standard and ultra versions. Ultra models transfer data faster than any hard drive! Rates of over 1GB per minute are supported.

Set up any IDE drive with all your original software. Attach blank target drives, and press "start". It's that easy! You can duplicate four drives in less time than it takes to copy one on a fast PC! Your duplicate drives will be identical, bit-for-bit perfect copies, with all the files, partitions, and information on the original drive. Building systems is tough enough. Why spend hours installing software? Save time. Save money. Call today and let us Fed-X your duplicator for a risk-free evaluation!

CORPORATE SYSTEMS CENTER
3310 WOODWARD AVE. • SANTA CLARA, CA 95054
WWW.DUPEIT.COM
408 330-5560

Over 80% of the Fortune 500 depend on CSC products. Shouldn't you? Call today. Most orders ship within 24 hours! Call now for more information and a free price comparison guide. Quantity discounts are available for dealers and system builders. Copyright laws must be observed when duplicating CDs and hard drives. © 2000 CSC.

Copyrighted material

MAXIMUM PC REPRINTS

Reprints of any article in **MAXIMUM PC** are available from **Reprint Management Services**™, the exclusive reprint agent. High-quality editorial and advertisement reprints can help your company in many ways:

- *Increased **exposure** for your product or service*
- *Credible, believable information that customers **trust***
- *Great **sales** tools for trade shows, mailings and conventions*
- *Powerful **educational resource** for customers and employees*

We tailor the reprint layout and design to your needs.

Reprints are more affordable than you think. Call for quotes on quantities as small as 100 copies.

YOUR BEST SALES TOOL IS ONLY A PHONE CALL AWAY!

RMS REPRINT MANAGEMENT SERVICES

KATIE NEWMOYER
Reprint Operations Specialist
For additional information please call (717) 399-1900

Greenfield Corporate Center
1811 Olde Homestead Lane
Lancaster, PA 17601
Fax (717) 399-8900
Web: www.rmsreprints.com • email: sales@rmsreprints.com

EARN YOUR COLLEGE DEGREE
ANYWHERE, ANYTIME!

Through AICS' distance education programs in computer science or information systems.

- Prepare for one of the 3.1 million tech jobs
- Flexible self-paced study
- Approved by more than 330 companies
- DANTES Affiliated
- Career-paced concentrations in networking, e-commerce, and programming.

Free catalog:
1-800-767-2427
or visit
www.aics.edu

ACCREDITED MEMBER DETC

AMERICAN INSTITUTE FOR COMPUTER SCIENCES
Birmingham, AL

BE A PC REPAIR PROFESSIONAL!

Nationally accredited, professional-level home study course. Learn about PC repair, trouble-shooting, installation, upgrading, and servicing. You could be a more valuable employee—or open a PC repair business one day.
For free career literature, send or call.

CALL NOW: 800-223-4542

Name _____

Age _____ Phone ( ) _____

Address _____

City/State _____ Zip _____

The School of PC Repair
430 Technology Parkway, Dept. JJL275
PCDI, Norcross, Georgia 30092 • *www.pcdi.com*

ADVERTISE IN THE MAXIMUM PC MARKETPLACE AND WATCH YOUR SALES SKY ROCKET!

FOR MARKETPLACE SALES CONTACT ALAN MEADOWS
415 468-4684 x2101

MEMORY

DESKTOP-LAPTOP-CAMERA-PRINTER
WE CAN BEAT ANY PRICE, ANYWHERE
CALL AROUND...THEN CALL US!!!
"NOBODY CAN BEAT US...NOBODY"
LIFETIME WARRANTY-NEVER A RE-STOCKING FEE

1-800-4-MEMORY

WWW.18004MEMORY.COM

ARTICLE REPRINTS from MAXIMUM PC

High-quality reprints of articles in this magazine are an ideal way to promote yourself, products or services ... or to introduce new ideas or stimulate learning within your organization.

Article reprints can serve as a powerful promotional or sales tool — include them with your brochures, newsletters, media kits, or hand them out at trade shows. (Minimum quantity per order is 100 copies for single color, 500 copies full color.)

RMS REPRINT MANAGEMENT SERVICES

For complete information on article reprints, please call:

(717) 399-1900

KATIE NEWMOYER, *Reprint Operations Specialist*

Greenfield Corporate Center, 1811 Olde Homestead Lane, Lancaster, PA 17601
Web: www.rmsreprints.com • email: sales@rmsreprints.com

MEMORY

PC66, PC100 & PC133 SDRAM
EDO, Fast Page, & SDRAM
5 Volt or 3.3 Volt
168Pin DIMMS or 72 Pin SIMMS
Buffered or Unbuffered
Memory for PC's, Mac, Sun and more!!

smsmemory.com

Buy Memory Direct from the manufacturer
Great prices & Quality
Lifetime Warranty
30 Day Satisfaction Guarantee
Secure internet ordering
Orders received before 3:00pm PST M/F shipped that day

Your #1 source for specialized memory as well as common memory types!!

Visit us on the web @ smsmemory.com

Or Call: 800-580-5118 or 408-492-9770 Fax: 408-492-9915
370 Laurelwood Road #106 Santa Clara, CA 95054

Copyrighted material

ink4art®
WWW.INK4ART.COM

Serving Great Deals on Ink Jet Products.

- Ink Jet Cartridges
- Specialty Papers
- Specialty Inks
- Unique Mac Products

Standard Inks:
Fits Epson Series

INK4ART BRAND CARTRIDGES fits

Black-400,440,600,640,700	$14.99
Black-740,800,850,1520	$15.99
3 Color all above models	$18.99
Photo Color Photo, Photo EX, 750,700	$18.99

Made Fresh Daily

New Improved Inks Inks!

Specialty Papers:

Paper Canvas	
10 pack	$9.99
100 pack	$49.99
Waterproof Photo Glossy	
10 pack	$9.99
100 pack	$29.99
Inkjet Transparency Film	
50 pack	$19.99

Call for pricing on cartridges for Canon printers.

iBookBag

New!

iPen light

Only $49.99

NOW ONLY $9.99

1-877-695-1477

VISA MasterCard DISCOVER

©2000 Ink4Art is a division of Eyecon Marketing, Inc. Sarasota, Florida

AD INDEX

For more information on MAXIMUM PC advertisers' products and services, please contact the companies below:

COMPANY	URL/PHONE#	PAGE#
Aberdeen	www.aberdeeninc.com/max	87-89
Adaptec	www.adaptec.com	46
Advanced Micro Devices	www.amd.com	2-3
Alienware	www.alienware.com	50-51
American Institute of Computer Science	www.aics.edu	93
American Power Conversion	www.apcc.com	61
ATI Technologies	www.atitech.ca	20
Boston Acoustics	www.bostonacoustics.com	10
Coast to Coast Memory	www.18004memory.com	93
Compaq Computer Corporation, Inc	www.compaq.com	C2-1
Corel	www.corel.com	58
Corporate Systems Center	www.corpsys.com	92
CyberStateU.com, Inc.	www.cyberstateu.com	62
Kenwood CD ROM Settlement	www.kenwoodtech.com/40xcdromsettlement/	22
Dell Computer Corporation	www.dell.com	C5-C8
Deneba Software	www.deneba.com	26
Diamond Multimedia	www.rioport.com	24
Dirt Cheap Drives	www.dirtcheapdrives.com	91
E-Book Systems, Inc.	www.ebooksys.com	83

COMPANY	URL/PHONE#	PAGE#
Edirol	www.edirol.com	90
EyeCon Marketing (Ink4Art)	www.ink4art.com	94
I.C.S.	www.ics.com	73
Kensington	www.kensington.com	56
Microprose	www.hasbrointeractive.com/microprose/index.cfm	34
Microsoft	www.microsoft.com/	28
Microsoft	www.microsoft.com/	12
Microsoft	www.microsoft.com/	13
Microsoft	www.microsoft.com/	15
eCOST	www.ecost.com	95
PC Power & Cooling	www.pcpowercooling.com	19
Plextor	www.plextor.com	54
The School of Web Site Design	800/223-4542	93
Samsung Electronics America, Inc.	www.samsung.com	23
SMS Group Incorporated	www.smsmemory.com	93
Sony	www.sony.com/di	4
TDK	www.tdk.com	6-7
Ulead Systems	www.ulead.com	64
Visa	www.visa.com	9
VR Toolbox Inc.	www.vrtoolbox.com	79

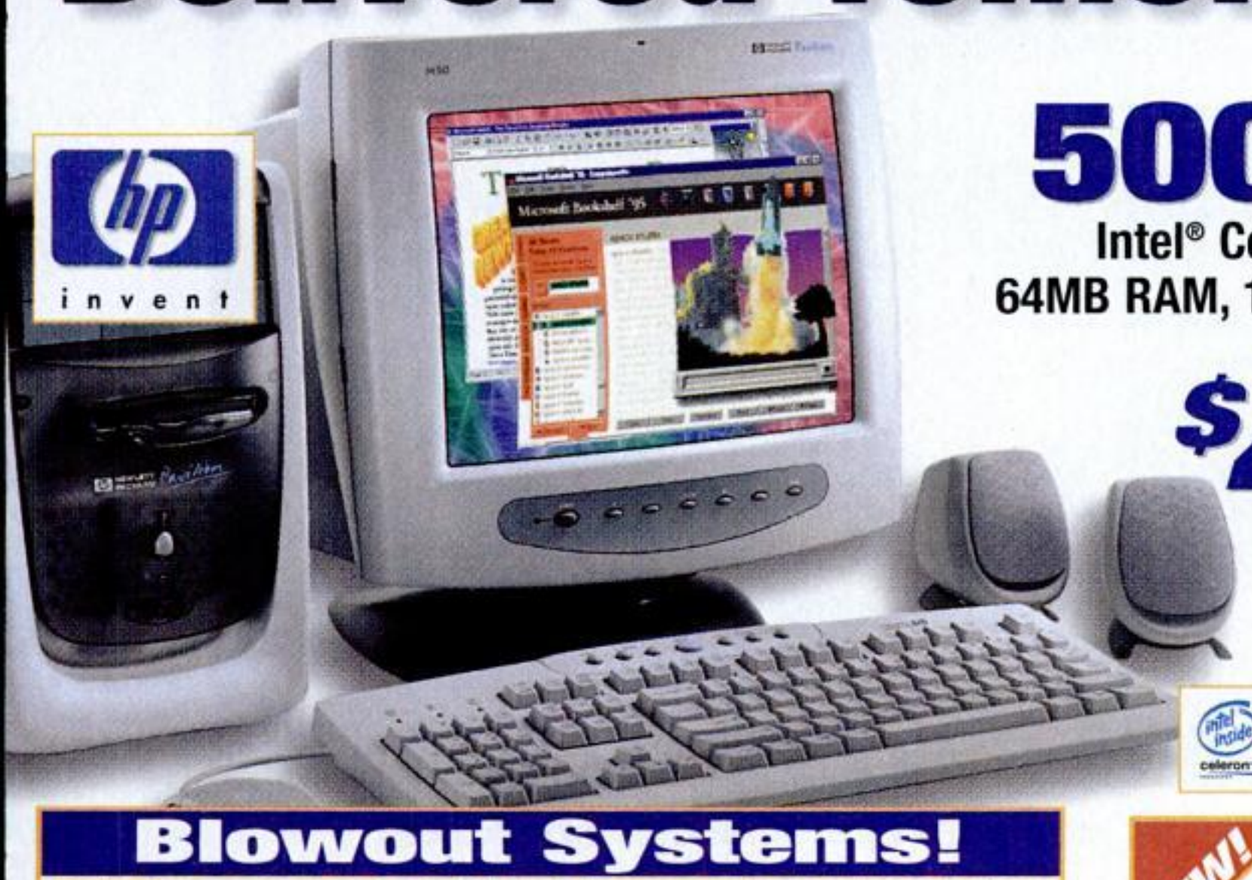
MAXIMUM PC (ISSN 1522-4279) is published monthly by Imagine Media Inc., 150 North Hill Drive, Suite 40, Brisbane, CA 94005, USA. Periodical class postage paid in Brisbane, CA, and at additional mailing offices. Newsstand distribution is handled by Curtis Circulation Company. Basic subscription rates: one year (12 issues) US: $20; Canada: $34; Foreign: $44. Basic subscription rates "Deluxe" version (w/CD): one year (12 issues/12 CD-ROMs) US: $30; Canada: $44; Foreign $54. US funds only. Canadian price includes postage and GST (GST#R128220688). Postmaster Send changes of address to Maximum PC, P.O.Box 51479, Boulder, CO 80328-1479. Standard Mail enclosed in version B only. Ride-Along enclosed in the following editions: C, C1, C2, C3, and C4. CPC Int'l Pub Mail# 0781029. Outside the U.S. and Canada, price is $53.95, U.S. prepaid funds only. For customer service, write Maximum PC, P.O. Box 51479, Boulder, CO 80328-1479; Maximum PC, 150 North Hill Drive, Brisbane, CA 94005. Imagine Media also publishes PC Gamer, Next Generation, MacAddict, PC Accelerator, PlayStation Magazine, and Business 2.0. Entire contents copyright 1999, Imagine Media Inc. All rights reserved. Reproduction in whole or in part is prohibited. Imagine Media Inc. is not affiliated with the companies or products covered in Maximum PC. PRODUCED AND PRINTED IN THE UNITED STATES OF AMERICA.

Copyrighted material

Technology Solutions for Tomorrow!

PC Mall

The Best Deals Delivered Tomorrow!



500MHz

Intel® Celeron™ processor
64MB RAM, 10.2GB Hard Drive
40X CD-ROM

$449

Pavilion 6630
#951916

Manufacturer reconditioned. Monitor and speakers sold separately.

Blowout Systems!

650MHz
Intel® Pentium® III processor
128MB RAM, 40GB Hard Drive
DVD, CD-RW
$999
HP Pavilion 9680c
#54891
Manufacturer reconditioned. Monitor and speakers sold separately.

500MHz
Intel® Pentium® III processor
64MB RAM, 13GB Hard Drive
Includes DVD!
$499
Tower 500A
#950995
Manufacturer reconditioned. Monitor and speakers sold separately.

Cameras

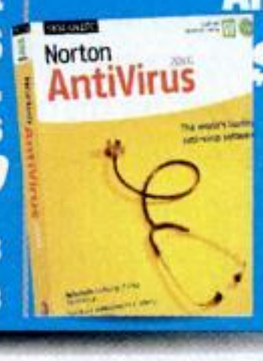
DCR-TRV20 Camcorder
Call for best price.
#80282
PC Mall is an authorized camcorder dealer for Sony, Canon, Panasonic and JVC

D-360L Digital Camera
$299.99
#57140
While supplies last!

New Software! Upgrade Today!

NEW! Microsoft Windows Millennium Ed. as low as $49.99
#85088
Upgrade from Windows 98

NEW! Norton AntiVirus 2001
$28.99
#850103
Price reflects $10 mfr. mail-in upgrade rebate from Norton AntiVirus 2000.



NEW!

Small and Light! Palm m100 Organizer
$149.99
#951523

NEW!

HP 9340i 10x4x32 Int. EIDE CD-RW Drive
$229.99
#951840

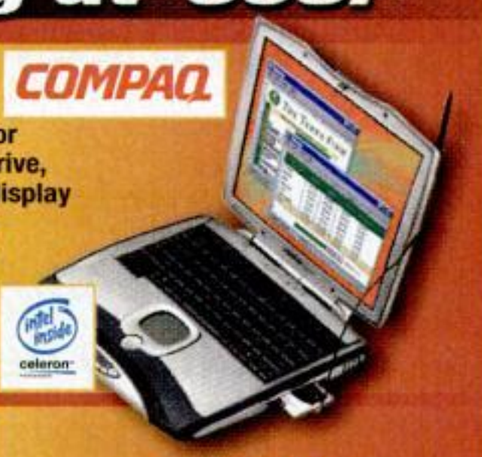
Best Seller!

HP DeskJet 932C Color Printer
$199.99
#57053

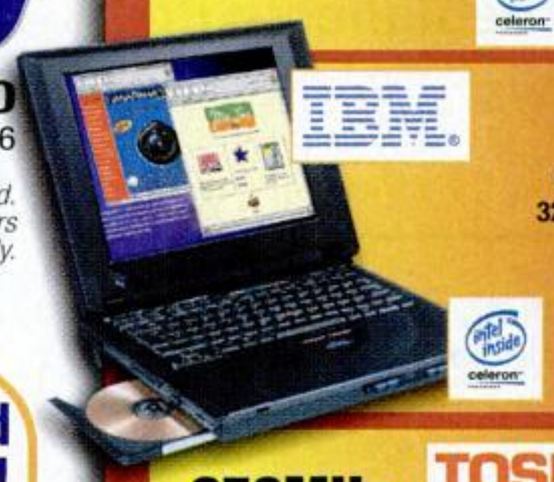
Call for best prices!

Notebooks starting at $869!

566MHz
Intel® Celeron™ processor
64MB RAM, 6GB Hard Drive,
24X CD-ROM, 13" HPA display
$1,499
Presario 14XL244 #848674

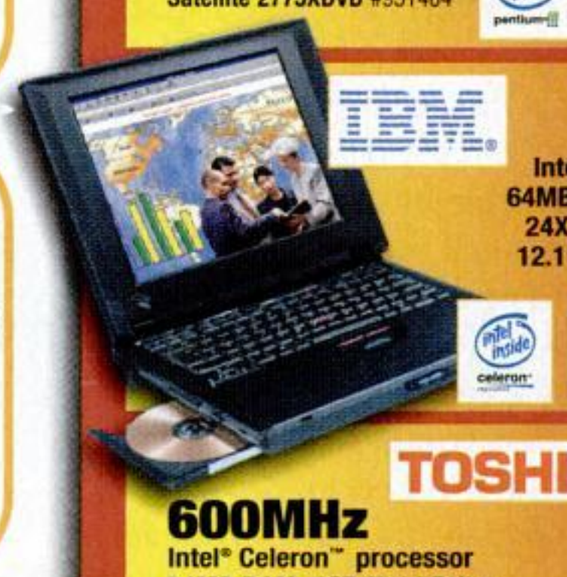


500MHz
Intel® Celeron™ processor
32MB RAM, 6GB Hard Drive
12.1" High-Performance Addressing display
$1,149
ThinkPad 1210 #950143



650MHz
Intel® Pentium® III processor
64MB RAM, 12GB Hard Drive,
DVD, 56K Modem,
14.1" TFT display
$2,199
Satellite 2775XDVD #951484

466MHz
Intel® Celeron™ processor
64MB RAM, 6GB Hard Drive,
24X CD-ROM, 56K Modem,
12.1" Active Matrix display
Includes DVD!
$1,199
ThinkPad 1441 #54846



600MHz
Intel® Celeron™ processor
64MB RAM, 6GB Hard Drive
13" Dual Scan display
$1,199
Satellite 2250XCDS #842663

Call Today for a FREE PC Mall Catalog!

Prices and specifications subject to change without notice. We do our best to be accurate but occasionally mistakes occur. We are not responsible for any typographical, photographic or technical errors. NOTE: Products and packaging depicted may differ from stock available at time of shipment; we reserve the right to substitute equivalent items. While supplies last.

Use Priority Code #ZPMP090

1-800-315-0026 pcmall.com

Fastest Overnight Delivery! Place your order as late as 10:00 p.m. EST and get it by 10:30 a.m. the next morning! FedEx

The Daily Glitch

Apex of Accuracy, Paragon of Truth * Monday, October 2, 2000

Roller Coaster Tycoon Charged with Deaths of Thousands

Commission determines theme park ride was willfully designed with fatal flaws

The Descent of Death, moments after final disembarkment.

The FBI has formally charged roller coaster tycoon Billy Jingles with the murder of more than 4,000 visitors to his Massacre Mountain theme park. The charge follows an investigation by the Consumer Product Safety Commission, which determined Jingles knowingly and willfully designed a roller coaster that would kill all its passengers.

The Descent of Death, the roller coaster in question, culminates in a 1,200-foot, 60-degree decline, immediately followed by a slight 45-foot incline with an unrestricted terminus. The Commission determined that by the time the coaster cars complete the decline, the inertia is such that only a steep, 1,200-foot incline could provide riders with a safe finale.

"It would appear that Jingles expressly designed his coaster for a 100-percent fatality rate," said safety inspector Brody Kane. "First, he left out any air brakes that might slow the coaster down. Second, the coaster just ends in the middle of nowhere—the ride is completely devoid of apparatus that might keep the cars on the tracks. Third, and perhaps most disturbingly, the ride's final 45-foot incline is curiously effective in propelling passengers over a giant tulip garden—where riders might actually land safely—and onto a hard earthen embankment marked 'Rider Depository.' Given the coaster's insidious design, we are inclined to rule that it is indeed a 'descent of death' in the most literal sense."

The FBI arrested Jingles, 11, without incident at his parents' house last Tuesday. Massacre Mountain blueprints seized from Jingles' computer hard drive suggest that the Descent of Death was originally designed to send coaster cars plunging into a giant lake of raw sewage at the ride's end. It appears this original plan was scrapped because Jingles had doubts about the toxicity of the sewage and was concerned that some riders might survive the ordeal.

Billy Jingles

According to the FBI, a total of 4,321 park attendees died on the Descent of Death over a three-day period before the ride was shut down. Located near a dense cluster of fast-food concession stands, the ride was one of Massacre Mountain's most popular attractions.

The Descent of Death fatalities follow an extensive history of problems at the beleaguered theme park. Attendees have long complained about interminable lines, high prices, and insufficient guest services. When it opened in January 2000, Massacre Mountain included just one bathroom, which was inconveniently located at the park's remote southeastern corner. Ignoring frequent requests for additional bathrooms, Jingles instead invested in more and more rides of increasingly dangerous designs. By June 2000, Jingles' own advisors notified him that the park was in a serious state of chaos. Jingles reportedly responded with a diabolical cackle and immediately began drafting the Descent of Death project.

Though still a child, Jingles is no stranger to controversy. In the late 1990s, he focused on large-scale real estate development, founding the infamous riverside community of Jingleville. Under Jingles' management, Jingleville initially enjoyed civic prosperity, but fell into disrepair when Jingles abruptly raised taxes to their legal limit, cut off the main artery of his city's water supply, and bulldozed his most lucrative high-rent district to make room for a nuclear power plant. Jingleville was demolished by a series of natural disasters in late 1999, but by that time, Jingles had already relocated to the west coast and was reinventing himself as roller coaster tycoon.

Jingles is being held at the Lego County Jail in downtown Legoland. Bail has been set at $1 million in Monopoly money.

—Jon Phillips

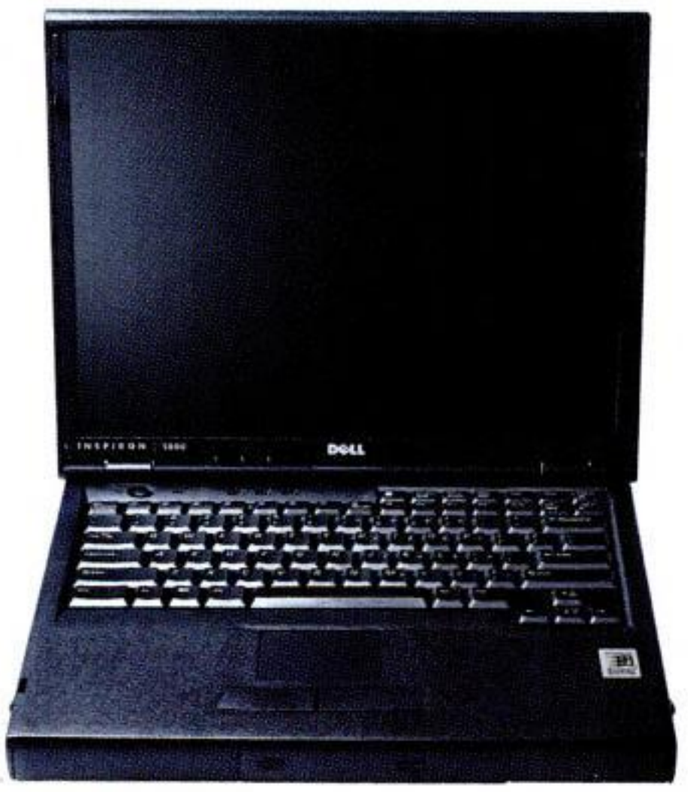
Copyrighted material

build your own computer.

[no safety goggles necessary.]

Build your dream machine from start to finish by including any of the features you choose.

With over 30 million potential configurations, you should have enough options to find exactly what you need for your system. And leave out exactly what you don't. Then again, with all of the latest and greatest technology at your fingertips, you may not want to leave out very much at all. Dell™ offers up to 1GHz of processing power on select Dimension™ desktops, or up to 750MHz on Inspiron™ notebooks, allowing you to cruise at any speed you'd like. And maximizing productivity will be a breeze with up to 75GB[5] of hard drive space on Dimension desktops. Find out more about all of this and our award-winning service and support options at www.dell4me.com. And you didn't even have to break a sweat, did you?



Dell™ Inspiron™ 5000e

DELL™ NOTEBOOKS:

DELL™ INSPIRON™ 3800

Design and Affordability

- Intel® Celeron™ Processor at 500MHz
- 12.1" SVGA TFT Display
- 32MB 100MHz SDRAM
- 4.8GB[5] Ultra ATA Hard Drive
- Modular 24X Max CD-ROM
- 2X AGP 8MB ATI RAGE Mobility™-M1 3D® Video
- 26.5WHr Li-Ion Battery with ExpressCharge™ Technology
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 1-Yr Limited Warranty[2]
- 1-Yr Next-Business-Day On-site Service[4]

$1399 E•VALUE CODE 89121-800913

As low as $38/Mo., for 48 Mos.[17]

DELL™ INSPIRON™ 5000e

Performance and Mobility

- Intel® Pentium® III Processor at 700MHz Featuring Intel® SpeedStep™ Technology
- 15" Ultra XGA TFT Display
- 64MB 100MHz SDRAM
- 5GB[5] Ultra ATA Hard Drive
- Modular Removable 8X Max DVD-ROM Drive
- 2X AGP 16MB ATI RAGE Mobility™ 128 3D® Video
- 59WHr Li-Ion Battery
- Internal V.90 56K Capable[6] FaxModem
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2]
- 3-Yr Next-Business-Day On-site Service[4]

$2749 E•VALUE CODE 89121-800927a

As low as $75/Mo., for 48 Mos.[17]

DELL™ INSPIRON™ 7500

Mobile Desktop

- Intel® Pentium® III Processor at 750MHz Featuring Intel® SpeedStep™ Technology
- 15.4" Super XGA TFT Display
- 96MB 100MHz SDRAM
- 20GB[5] Ultra ATA Hard Drive
- Removable Combo 24X Max CD-ROM and Floppy Drive
- 2X AGP 8MB ATI RAGE Mobility™-P 3D® Video
- 79WHr Li-Ion Battery
- Internal V.90 56K Capable[6] FaxModem
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2]
- 3-Yr Next-Business-Day On-site Service[4]

$3199 E•VALUE CODE 89121-800931a

As low as $87/Mo., for 48 Mos.[17]

Copyrighted material

DELL™ DESKTOPS:

DELL™ DIMENSION™ L Series

Affordable Desktop Solution

- Intel® Celeron™ Processor at 566MHz
- 64MB SDRAM
- 7.5GB[5] Ultra ATA Hard Drive
- 15" (13.8" vis) E551 Monitor
- Intel® 3D® AGP Graphics
- 48X Max CD-ROM Drive
- SoundBlaster 64V PCI LC Sound Card
- PC Speakers
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]

$849 E•VALUE CODE 89121-500908a

As low as $23/Mo., for 48 Mos.[17]

DELL™ DIMENSION™ L Series

Affordable Desktop Solution

- Intel® Pentium® III Processor at 733MHz
- 64MB SDRAM
- 7.5GB[5] Ultra ATA Hard Drive
- 15" (13.8" vis) E551 Monitor
- Intel® 3D® AGP Graphics
- 48X Max CD-ROM Drive
- SoundBlaster 64V PCI LC Sound Card
- PC Speakers
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]

$899 E•VALUE CODE 89121-500908b

As low as $25/Mo., for 48 Mos.[17]

DELL™ DIMENSION™ 4100 Series

Advanced Performance, Smart Value

- Intel® Pentium® III Processor at 866MHz
- 128MB SDRAM at 133MHz
- 20GB[5] Ultra ATA Hard Drive
- 17" (16.0" vis, .26dp) M781 Monitor
- 32MB NVIDIA TNT2 M64 4X AGP Graphics
- 12X Max DVD-ROM Drive
- SB Live! Value Digital
- Altec Lansing® ACS-340™ Speakers with Subwoofer
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]

$1599 E•VALUE CODE 89121-500915y

As low as $44/Mo., for 48 Mos.[17]

DELL™ DIMENSION™ XPS B Series

Cutting-Edge Technology

- Intel® Pentium® III Processor at 1GHz
- 128MB RDRAM ■ 30GB[5] Ultra ATA Hard Drive
- 19" (17.9" vis, .24 - .25AG) P991 FD Trinitron® Monitor
- NEW 32MB DDR NVIDIA GeForce2 GTS 4X AGP Graphics Card
- 12X Max DVD-ROM Drive
- SB Live! Value Digital
- Harman Kardon HK-595 Surround Sound Speakers with Subwoofer
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]

$2499 E•VALUE CODE 89121-500924y

As low as $68/Mo., for 48 Mos.[17]

DELL™ UPGRADES:

SOFTWARE & PERIPHERALS

Printers:
- HP® DeskJet® 952C – $249 after $50 HP® Mail-In Rebate (Reg. $299)[38]
- HP® DeskJet® 932C, add $199
- Epson® Stylus Color 740 , add $99

Scanners:
- HP® ScanJet® 5300C, add $199 after $50 HP® Mail-In Rebate (Reg. $249)[38]
- HP® ScanJet® 4300, add $149
- UMAX® Astra® 2100U, add $89

Power Protection:
- Pro 8T2 SurgeArrest, add $39

Software:
- Ultimate Sports Pack Plus (Dimension™ only)[16], add $99
- Home Reference 4-pack[16], add $79

SERVICES

Internet Service:
- 1-Yr Dellnet™ Internet Access[10] with 20MB of Online Backup[12], add $99

Service Upgrades:
- Dell™ Dimension™ Premier 3-Yr At-Home Service[4], add $99
- Dell™ Inspiron™ 3800 Notebook 3-Yr Next-Business-Day On-site Service[4], add $149

Payment Solutions:
- Dell™ 48-Month Purchase Plan[17]
- Dell™ E-Check (Automatic Checking Withdrawal)

intel inside pentium® III

Includes Windows Millennium Edition — the home version of the world's favorite software.

[10]Includes 150 hrs./month, plus $1.50/hr. (or fraction) over 150 hours. #800/888/877 access charged $4.95/hr. extra. Excludes taxes and telephone charges. Additional $1.00/hr. surcharge in HI and AK. [17]Monthly payment based on 13.99% APR. APR FOR QUALIFIED CUSTOMERS VARIES BY CREDITWORTHINESS OF CUSTOMER AS DETERMINED BY LENDER. Taxes and shipping charges extra. From American Investment Bank, NA to U.S. state residents (including D.C.) with approved credit. Availability may be limited in some states.

Prices, specifications, and availability may change without notice. Taxes and shipping charges extra, and vary. Cannot be combined with other offers or discounts. U.S. only. Offer valid for Dell Home Systems Co. only. [2]For a copy of our Guarantees or Limited Warranties, write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, Texas 78682. [4]At-Home or on-site service provided via third-party contract with customer. Availability varies. Technician will be dispatched, if necessary, following phone-based troubleshooting. To receive Next-Business-Day service, Dell must notify the service provider before 5pm (customer's time). Other conditions apply. [5]For hard drives,GB means 1 billion bytes; accessible capacity varies with operating environment. [6]Download speeds limited to 53Kbps. Upload speeds are less (about 30Kbps) and vary by modem manufacturer and online conditions. Analog phone line and compatible server required. [12]Online backup services provided by third-party agreement with the customer. Limited to 20MB of storage; additional space available at additional charge. Dell is not responsible for lost data. [16]Software, packaging, or documentation may differ from retail versions. [38]For rebate details and coupons, call 800-728-9665 for HP. [39]Microsoft's official launch date for Windows Me is September 14, 2000. Intel, the Intel Inside logo, and Pentium are registered trademarks, and Intel SpeedStep and Celeron are trademarks of Intel Corporation. MS, Microsoft, IntelliMouse, and Windows are registered trademarks of Microsoft Corporation. HP and DeskJet are registered trademarks and OpenView is a trademark of Hewlett-Packard Corporation. Trinitron is a registered trademark of Sony Corporation. ©2000 Dell Computer Corporation. All rights reserved.

DELL4me.com

contact us today | **800.433.2757** | www.dell4me.com | DELL.COM

Copyrighted material

we've won the pc world "best pc reliability and service" award 7 years straight. plus, for 9 years, pc magazine readers have rated us "A" for desktops.

[that should make your buying decision very, very, very, very, very, very, very, very, very, very, very, very, very, very easy.]

Dell™ PCs. Powerful. Reliable. And winner of the most service and support awards in 1999.

DELL™ DIMENSION™ 4100 Series

Advanced Performance, Smart Value

- Intel® Pentium® III Processor at 800MHz
- 128MB SDRAM at 133MHz
- 20GB[5] Ultra ATA Hard Drive
- 17" (16.0" vis, .28dp) E770 Monitor
- 16MB ATI RAGE™ 128 Pro
- 48X Max CD-ROM Drive
- SB Live! Value Digital
- harman/kardon Speakers
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]

$1299 E•VALUE CODE 89120-500912y

DELL RECOMMENDED UPGRADES:

- Premier 3-Yr At-Home Service[4], add $99
- Harman Kardon HK-595 Surround Sound Speakers with Subwoofer, add $80

Buying a PC can be nerve-racking. You worry about getting one that comes with the software you want, the power you need, and the service you can't live without. Buying a Dell™ can help. Our computers are personalized by you, and backed by our award-winning service. In 1999 alone, we won more service and support awards than any other computer manufacturer. How? By offering you 24-hour/365 day-a-year online and over-the-phone support for the life of your computer. We even offer at-home service[4] during the first year, if we can't solve your problem online or by phone. Around-the-clock, go-anywhere-to-fix-your-computer service and support, is just one more way Dell4me™ is helping you get the most out of your PC. And a better night's sleep.

intel inside pentium® III

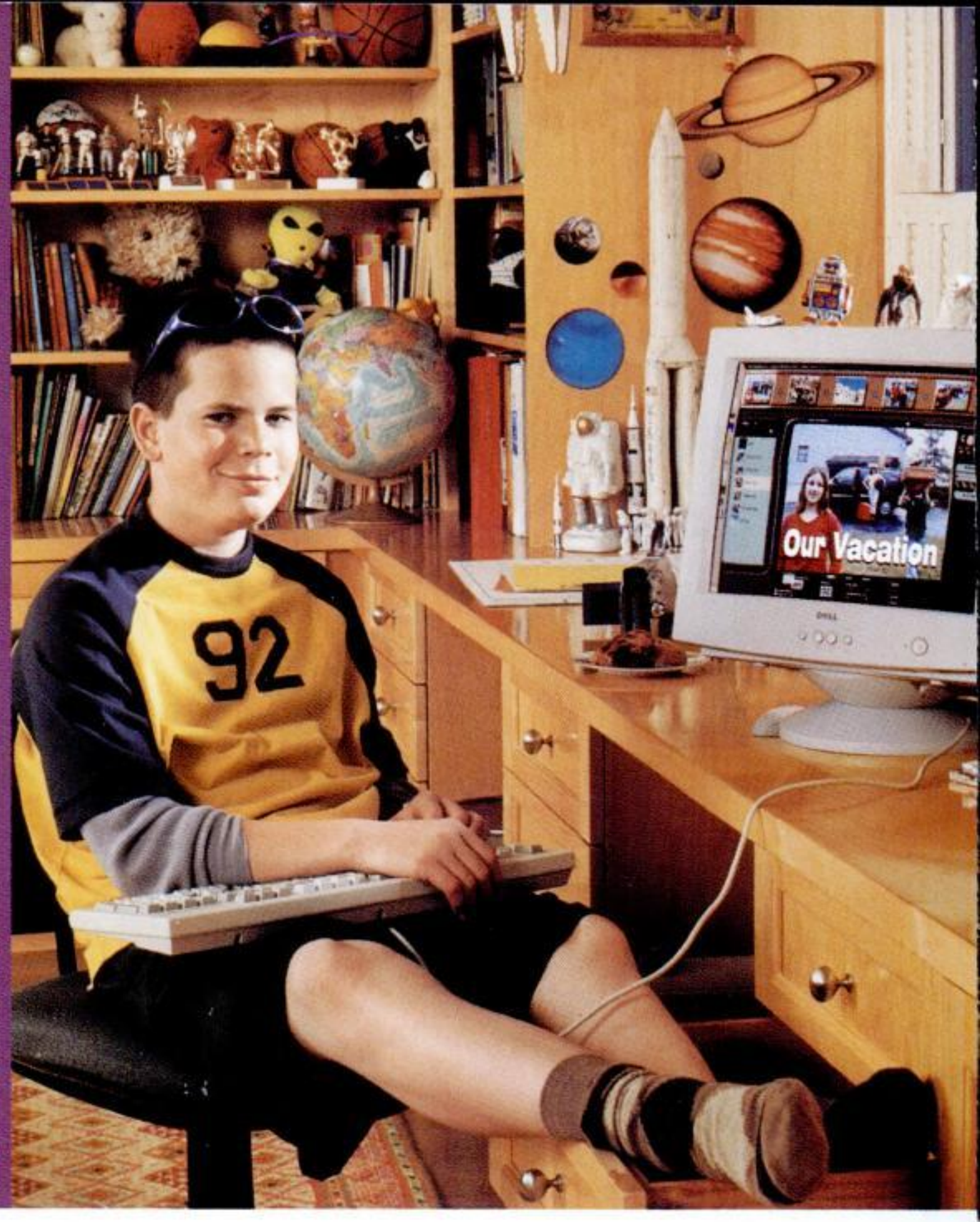
DELL4me.com

contact us today | 800.433.2757 | www.dell4me.com | DELL COM

Includes Windows Millennium Edition — the home version of the world's favorite software.

Copyrighted material

17 hours of our trip to Mt. Rushmore edited down to 4 thrilling minutes.



The Dell™ Movie Studio. Movie Making made easy.

With our New Dell™ Movie Studio solution, you'll be editing digital videos, adding soundtracks, selecting still images, and e-mailing your brilliance to the world faster than you can say "that's a wrap." Dell Movie Studio comes pre-tested and factory-loaded on select Dimension™ desktops, featuring powerful Intel® Pentium® III processors. And, of course, it's all backed by Dell's award-winning technical support. Dell Movie Studio. It's just one more way Dell4me™ helps your family get the most out of your PC. For more information go to www.dell4me.com/moviestudio

DELL™ DIMENSION™ 4100 Series

Dell's Movie Studio

- Intel® Pentium® III Processor at 800MHz
- 128MB SDRAM at 133MHz
- 30GB[5] Ultra ATA Hard Drive
- 17" (16.0" vis) E770 Monitor
- 32MB NVIDIA TNT2 M64 4X AGP Graphics
- 12X Max DVD-ROM Drive
- SB Live! Value Digital
- Altec Lansing® ACS-340™ Speakers with Subwoofer
- V.90 56K Capable[6] PCI Telephony Modem for Windows®
- IEEE 1394 PCI Card with MGI VideoWave® III Video Editing SW, Dell™ Edition
- MS® Works Suite 2000 ■ MS® Windows® Me[39]
- 3-Yr Limited Warranty[2] ■ 1-Yr At-Home Service[4]

$1599 E•VALUE CODE 89119-500915v

DELL RECOMMENDED UPGRADES:

- Canon® ZR10 Digital Video Camcorder, add $899
- Add 8x/4x/32x CD-RW Drive, add $199

intel inside pentium® III

DELL4me.com

contact us today | **800.433.2757** | www.dell4me.com | DELL.COM

Includes Windows Millennium Edition — the home version of the world's favorite software.

Copyrighted material